ASTM Bulletin

JULY 1951
No. 175

NEWS—Annual Meeting—Sessions, Committee Meetings, New Tentatives, Honorary Members, Awards of Merit; Emergency Standards Procedure; Districts.

PAPERS—President's Address; Fatigue Testing Equipment; Hiding Power of Paints; Laminated Plastics; Density of Granular Polymers; Determination of Additives in a Base Material; Bitumen Testing Penetrometer.

American Society for Testing Materials

Reg. U. S. Pat. Off.

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This Issue Contains

NEWS ABOUT THE SOCIETY AND ITS COMMITTEES:

MISCELLANEOUS NEWS NOTES:

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ASTM BULLETIN

"Promotion of Knowledge of Materials of Engineering, and Standardization of Specifications and Methods of Testing"

TELEPHONE—Rittenhouse 6-5315 R. E. Hess, Editor CABLE ADDRESS—TESTING, Philadelphia

R. J. Painter, Associate Editor

Number 175 JULY, 1951

Record Breaking Annual Meeting; 615 Committee Meetings; 2277 Registration

23 Technical Sessions Include Seven Symposiums; Many New Standards; Much New Work Under Way

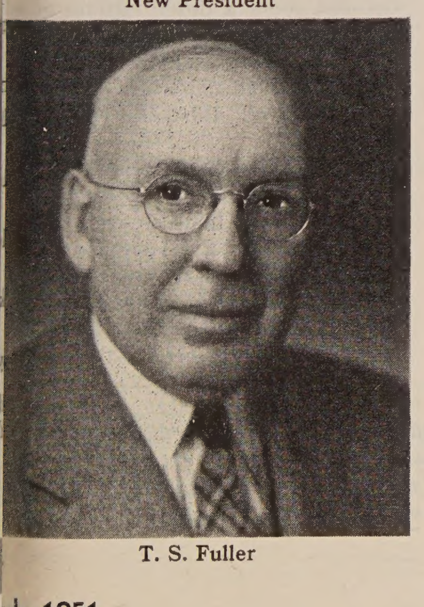
How can one cover in ny succinct article the important hap- enings at a meeting where there are 23 ormal technical sessions and over 600 neetings of technical committees? Ob- iously, it is almost impossible, but in ne material which follows, there is iven in condensed form news accounts f the technical sessions with their 110 apers and reports, and statements on najor committees' activities.

Information and photographs are iven of the new officers, new honorary nembers, winners of the 1951 Awards of Ierit, and medal winners.

It is hoped the material is so arranged hat those concerned with specific fields ay readily locate news of particular nterest.

Supplementing this material will be he usual *Summary of Proceedings* to be nailed to each member of the Society ithin the next few weeks. This *Sum- ary* gives actions on standards and entatives and, together with the pre- rinted reports of the technical commit- es, gives full information on the technical business transacted at the meeting.

New President



T. S. Fuller

Many New and Revised Standards

From the accompanying summary of actions taken at the Annual Meeting affecting standards and tentatives, it will be noted that 55 new tentatives, which represent new work, were approved, and that there were upwards of 200 previously published tentatives or standards that were revised.

In a separate article in this BULLETIN there is a complete list of the *new* and *extensively revised* tentative specifications and tests. Many members are interested especially in the serial designations that have been assigned.

Standards Published.—All of the new and revised standards acted on at the meeting will be published in the 1951 Supplement to the Book of Standards. There will be a Supplement to each Part of the Book, and these will appear in the winter of 1951–1952. In the meantime, many of the specifications and tests will appear in the special compilations of standards on which work is under way. Many of these compilations, for example, those of petroleum, textiles, and others, will be issued in the fall, and a determined effort is made to issue separates of the standards as soon as possible. All of the new tentatives were preprinted in the respective committee reports, and it is presumed the members particularly interested have requested copies of these reports.

Record Attendance

Various factors affect the attendance at a meeting, but it is significant that with no exhibits this year, a new high in registered attendance was recorded of 2277, compared with 2131 last year. Unquestionably the large number of committee meetings was the major factor in bringing so many of the country's leading materials men to Atlantic City. For the most part, the committee meetings were very well attended, and while the number present at some of the technical sessions was not particularly impressive, there was at all meetings a reasonably good audience.

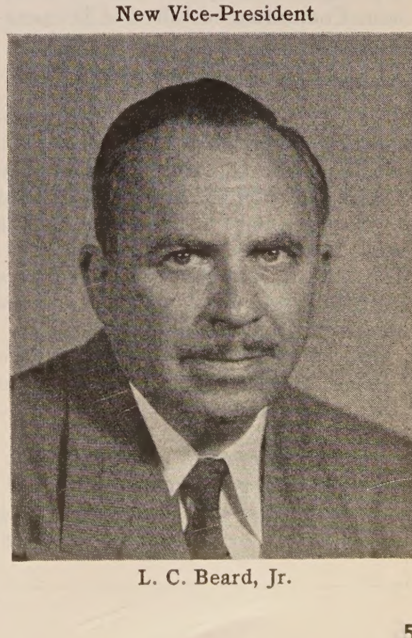
New Officers

Results of the letter ballot on election of new officers were announced at the Tuesday Luncheon Session by the Chairman of the Tellers' Committee, H. W. Stuart. The newly elected members of the Board of Directors who were present were introduced, as was the new President, T. S. Fuller, General Electric Co., and the new Vice-President, L. C. Beard, Socony Vacuum Oil Co., New York, each of whom spoke briefly. Photographs of the new officers and biographical material appear elsewhere in this BULLETIN.

Annual Dinner and Entertainment; Ladies' Program

THE Philadelphia District, through its active Council, was responsible again for the 1951 Annual

New Vice-President



L. C. Beard, Jr.

REGISTRATION—ANNUAL MEETINGS

	Year	Members	Committee Members	Visitors	Total	Ladies
Atlantic City......	1942	835	264	275	1374	219
New York........	1944	1185	368	510	2063	30 to 40
Buffalo...........	1946	978	405	452	1835	About 100
Atlantic City......	1947	1071	469	246	1786	320
Detroit...........	1948	1160	358	250	1768	133
Atlantic City......	1949	1092	530	235	1857	335
Atlantic City......	1950	1160	637	334	2131	408
Atlantic City......	1951	1220	660	402	2282	393

Dinner, at which there were about 325 present. The interesting entertainment program which followed the dinner, the dinner music, and provisions for dancing, which lasted until midnight, were all underwritten through a special fund raised by the Philadelphia group. As at the two previous Annual Meetings, the dinner was purely a social event, with no business functions or addresses.

Ladies' Program

A very fine program of entertainment and events was available for the some 375 ladies attending the meeting, and many expressed delight at the treats which Mr. Howard Phelps, Chairman of the Ladies' Entertainment Committee, had arranged. There was the usual Monday afternoon tea with several palmists busy, and Tuesday night an unusually interesting lecture-demonstration—"The Romance of Musical Boxes" was given. Many rare chimes and music boxes were demonstrated. On Wednesday there was a tour of the Haddon Hall kitchens, and on Thursday there was an excellent colored film showing complete production of the world-famed Lenox china, following which the ladies inspected many examples of this ware, as arranged by J. E. Caldwell & Co., Philadelphia. A good many of the ladies attended the annual luncheon and also the dinner. On Sunday evening many of the ladies and men at the meeting enjoyed an informal showing of Kodachrome travel slides sponsored by the ASTM-ASME Joint Committee on Effect of Temperature.

Awards

THE various awards recognizing outstanding technical papers, which include the Charles B. Dudley Medal, the Richard L. Templin, Sam Tour, and Sanford E. Thompson Awards were made at the Annual Meeting. The award winners are as follows (further biographical material appears on a later page of this BULLETIN):

The Twenty-third Award of the Charles B. Dudley Medal went to Professors D. S. Clark and P. E. Duwez, Associate Professors of Mechanical Engineering, California Institute of Technology, Pasadena, Calif., for their paper "The Influence of Strain Rate on Some Tensile Properties of Steel," published in the 1950 *Proceedings*.

The Sixth Richard L. Templin Award was made to R. L. Templin, Assistant Director of Research and Chief Engineer of Tests, and W. C. Aber, Assistant Chief, in Charge of Calibration Section, Mechanical Testing Division, Aluminum Company of America, New Kensington, Pa., for their paper on "A Method for Making Tension Tests of Metals Using a Miniature Specimen," published in the 1950 *Proceedings*.

The Third Sam Tour Award was made to C. T. Evans, Jr., Chief Metallurgist, The Elliott Co., Jeannette, Pa., for his paper on "Oil Ash Corrosion of Metals at Elevated Temperatures," published in the Symposium on Corrosion of Materials at Elevated Temperature, STP No. 108.

The Ninth Sanford E. Thompson Award was given to R. C. Mielenz, Head, Petrographic Laboratory; L. P. Witte, Head, Durability Laboratory, and O. J. Glantz, Head, Cement Laboratory, respectively, U. S. Bureau of Reclamation, Denver, Colo., for their paper entitled "Effect of Calcination on Natural Pozzolans," presented at the Pacific Area National Meeting in October, 1949, and published in the Symposium on Use of Pozzolanic Materials in Mortars and Concretes, STP No. 99.

"Balancing the Economy for Defense Production"

A LARGE audience greeted Nathaniel Knowles, Deputy Administrator, Defense Production Administration, when he presented his guest address on "Balancing the Economy for Defense Production." In charge of problems of strategic materials, conservation, programming and scheduling in DPA, Mr. Knowles gave an interest-

Nathaniel Knowles

ing, straightforward discussion of number of the problems confront Washington and the country, and carefully detailed the ultimate aims mind. An extended abstract of his dress appears elsewhere in this BULLETIN.

Following Mr. Knowles' addr President Markwardt called on Mess N. L. Mochel and John R. Townse each of whom spoke pointedly on subject of materials production shortages.

Marburg Lecture on Corrosion Testing

F. L. LAQUE, in Charg the Corrosion Engineering Sect International Nickel Co., New Y presented an outstanding Edgar M burg Lecture covering the sub "Corrosion Testing."

He evaluated many of the wi used tests such as the acid proced rust color effects, salt spray test, pe arities of immersion tests, galvanic rosion and humidity tests, suppor his comments with a great amoun data. His lecture was necessarily breviated in presentation but wil published in full by the Society du the late summer. Actually, whil covered about a dozen significant jects in his oral presentation it is cated the final published lecture wi volve about 40 important aspects subdivisions of this field of corro testing.

Concerning the accelerated s tests, Mr. LaQue noted they ha weakness which tends to overemph the corrodibility of the metal and u estimate the protective value of inso adherent corrosion products, suc rust. In discussing the effects of tion of test specimens, he supporte

This BULLETIN gives Staff notes on the meetings, technical sessions, and symposiums; it also covers highlights of the technical committee meetings and actions. With information on new officers, award winners, and the President's address, it provides broad coverage of ASTM work. Extra copies of this BULLETIN are available without charge to members who would like to put a copy in the hands of friends or associates.

American practice of inclined exposure in contrast to the British preference for a vertical position. He discussed the method of evaluating performance by using weight loss *versus* time data as against the visual perforation system used in a number of ASTM programs. None of the problems of corrosion are simple ones, and he cited calibration of atmospheres as one of these. There is no such thing as the most corrosive surroundings because different metals, for example aluminum and nickel, act differently in marine and industrial atmospheres. Zinc may have a straight-line relationship between corrosion and time in industrial atmospheres but not in a marine atmosphere where protective corrosion products are built up. In conclusion, Mr. LaQue paid tribute to the cooperative spirit shown by all those concerned with corrosion work and noted that his lecture embodied contributions and data from many working in his field.

It is felt the lecture will be of widespread and significant interest to all concerned with corrosion and its evaluation and prevention. Further announcement will be made concerning the date of its publication.

Notes on Some of the Sessions

Symposium on Acoustical Materials

ALTHOUGH acoustical materials are today being used extensively in a variety of applications, there are very few test methods for determining the properties of these materials. Because of this need and to sponsor other standardization and research work, ASTM Committee C-20 on Acoustical Materials has been established. To focus attention on the background leading up to the organization of C-20, and to outline the many problems which Committee C-20 is actively engaged in solving, a symposium was held at the Annual Meeting.

Wallace Waterfall, Executive Secretary, Acoustical Materials Assn., gave in a very interesting manner a brief history of the industry and H. A. Leedy, Chairman of the Committee, Armour Research Foundation, described the origin and activities of Committee C-20. The papers which followed reflected the investigations being conducted in the subcommittees of C-20 dealing with various aspects of acoustical materials. Titles and authors were as follows:

The Measurement of Sound Absorption—Hale J. Sabine, The Celotex Corp.
Combustibility of Acoustical Materials—Wallace Waterfall, Acoustical Materials Assn.
Maintenance of Acoustic Materials—Peter Chrzanowski and Albert London, National Bureau of Standards
Application of Acoustical Materials—L. F. Yerges, U. S. Gypsum Co.
Basic Physical Properties of Acoustical Materials—William Jack, Johns-Manville Research Center

Aluminum Die Castings and Creep Properties of Other Aluminum Alloys

AN INTERESTING report on a comprehensive investigation of the effect of process variables on the properties of aluminum die castings by W. Babington and D. H. Kleppinger presented some pertinent aspects of this problem. For many years there has been much speculation relative to the effect of certain variables inherent in the die-casting process upon the quality of die castings produced. The "goose neck" die-casting machines have been largely supplanted by the "cold-chamber" machines employing injection pressures considerably higher than those previously used. Advantages claimed for castings produced in the cold-chamber machines include lower iron content, improved density, and better mechanical properties. As a result, the trend in the manufacture of die-casting machines has been in the direction of increasing injection pressures. Also literature has little information as to whether the improvements are due to high injection velocity or to high pressure on the solidifying metal.

Based upon the results obtained from the study the following conclusions are among those drawn:

1. Castings made with a 0.030-in. gate had consistently higher quality indices and mechanical properties, under comparable casting conditions than those made with a 0.090-in. gate.
2. The soundness and strength of castings made with a high plunger speed are superior under comparable conditions of pressure and venting to that of castings made with a slow plunger.
3. The thickness of die gate appears to be a factor in the relationship between calculated pressure and measured metal pressure.

Three papers on the creep properties of aluminum alloys were presented by F. M. Howell of the Aluminum Company of America on behalf of the authors, O. D. Sherby, J. E. Dorn, and T. E. Tietz of the University of California.

Over the past few years many engineers have expressed increasing interest in the use of aluminum alloys in elevated temperature service. Creep and stress-rupture data are now available for some sheet materials in the precipitation-hardened state, annealed and cold-rolled conditions as well as for a few casting alloys. These papers present additional data on creep and stress-rupture properties of aluminum alloys.

The first of these papers covered the effect of annealing on the creep properties of 2S-O alloy and showed that the creep rate was found to decrease with increasing temperatures of anneal, irrespective of grain size, within the ranges of stress and temperature which were investigated (650 to 1150 F.). To summarize the paper the following three conclusions are given:

1. A stabilizing anneal, which introduces no change in grain size, in-

SUMMARY OF ACTIONS TAKEN AT ANNUAL MEETING AFFECTING STANDARDS AND TENTATIVES

	Existing Tentatives Adopted as Standard	Standards in Which Revisions Will Be Adopted	New Tentatives	Revisions of Standard and Reversion to Tentative	Tentative Revisions of Standards	Existing Tentatives Revised	Standards and Tentatives Withdrawn	Present Total Standards Adopted	Present Total Tentatives
A. Ferrous Metals—Steel, Cast Iron, Wrought Iron, Alloys, etc.	3	3	5	17	2	20	1	100	147
B. Non-Ferrous Metals—Copper, Zinc, Lead, Aluminum, Alloys, etc.	5	28	9	1	0	29	1	119	89
C. Cement, Lime, Gypsum, Concrete and Clay Products	8	10	9	0	8	3	0	164	75
D. Paints, Petroleum Products, Bituminous Materials, Paper, Textiles, Plastics, Rubber, Soap, Water, etc.	60	28	33	4	10	35	7	631	365
E. Miscellaneous Subjects, Testing, etc.	1	1	0	1	0	4	0	38	49
Total	77	70	56	23	20	91	9	1052	725

Head Table at the ASTM Luncheon—June 19. From left to right: Vice-President L. C. Beard, Jr.; Frank G. Richart, retiring Vice-President and new Honorary Member; Past-President H. H. Morgan, new Honorary Member; Past-President T. A. Boyd, who this year retired from the Board of Directors after eight years of service; Retiring President L. J. Markwardt; Past-President J. G. Morrow who presided; incoming President T. S. Fuller; Past-President T. G. Delbridge, new Honorary Member; A. T. Goldbeck, new Honorary Member; L. H. Winkler, Chairman of Award of Merit Committee; Executive Secretary C. L. Warwick.

creases the creep properties of 2S-O alloy over the ranges of temperatures and strain rates of interest in creep testing. Higher annealing temperatures cause grain growth, inducing further resistance to creep and stress rupture.

2. The data obtained suggest that the improved creep resistance generally reported for coarse-grained materials at elevated temperatures might be attributable to greater grain perfection rather than the grain size *per se*.
3. The experimental results appear to be in quantitative agreement with the present concept of the role of dislocations in the processes of creep.

The second paper covered creep properties of two tempers of 63S extruded aluminum alloy and showed that the 63S-T6 materials which also were quenched from the extrusion temperature and then artificially aged presented creep properties superior at all conditions of test to those of the extruded and artificially aged 63S-T5. However at 300 and 400 F. the creep properties of 63S-T6 approximated those of 63S-T5, especially at the lower creep rates.

The final paper covered the creep properties of some forged and cast aluminum alloys as follows:

Forgings: B18S-T61, 18S-T61, A51S-T6
Permanent-mold castings: 355-T71, A132-T551, 333-T533
Sand castings: 355-T71, 142-T77, A355-T51.

The creep and stress-rupture properties of these alloys are reported for the range of 90 to 400 F. An interesting aspect of the report is that the permanent-mold casting 355-T71 is shown to have superior creep resistance to the sand casting of the same composition at temperatures over 90 F. to about 375 F. However, it appears that at higher temperatures the sand casting might acquire higher resistance to creep and stress-rupture than the permanent-mold casting.

Bulk Sampling

THE sampling of materials in bulk lots is encountered daily in the purchase and sale of materials and involves millions of dollars on the basis of the average quality of the products being exchanged. The problems of sampling materials that occur in bulk form or in packages were discussed at length in the "Symposium on Bulk Sampling." This symposium was sponsored by Committee E-11 on Quality Control of Materials through its task group on bulk sampling. The task group is under the chairmanship of W. E. Deming, of the Bureau of the Budget, who opened the symposium with a general introduction which stressed the importance and broad significance of such sampling operations in the purchase of materials.

The first paper by Joseph Manuele on "Materials Handling for Bulk Sampling" discussed methods of handling bulk materials and evaluating their average quality within relatively close limits. He pointed out that one of the best examples of the application of the principles discussed in his paper is contained in the ASTM Methods of Core Sampling of Wool in Packages for Determination of Percentage of Hard Scoured Wool Content (D 1060 – 49 T).

The "Economic Accumulation of Variance Data in Connection with Bulk Sampling" by Louis Tanner and Melvin Lerner discussed a plan whereby data may be made available for variance estimates even though samples are composited for economy in testing.

The problems encountered in sampling certain types of food products were discussed by C. W. Dunnet and J. W. Hopkins in their paper on "Two-Stage Acceptance Sampling by Attributes." These authors discussed a minimum-cost two-stage single sampling plan for good and bad quality lots with specified risks of calculated error.

The second session of the symposium was devoted to three papers dealing with the problems of sampling coal. A. A. Orning of Carnegie Institute o[f] Technology in his paper on "Coa[l] Sampling Problems" discussed the pecu[-]liarities of coal sampling and the basis fo[r] design of sampling procedures. Th[e] examples given in the paper were base[d] on ash content.

The paper by W. M. Bertholf o[n] "The Analysis of Variance in a Sam[-]pling Experiment" presented a theoreti[-]cal discussion of the over-all analysis o[f] variance. He also presented method[s] of calculation and an extension of th[e] analysis of variance to include a group[-]to-group comparison of the estimates o[f] the unit increment variance and sug[-]gested methods of adjustment. M[r.] Bertholf also presented an outline o[f] "The Design of Coal Sampling Proce[-]dures" which contain equations rela[t-]ing to the fundamental sampling con[-]stants of a coal (as variances) to the ob[-]served variance of a series of sample[s] composed of N increments each [of] weight w.

There was considerable interest [in] this subject of bulk sampling as ev[i-]denced by the extensive discussion [of] the various papers in both sessions.

Session on Cementitious Materials and Asphalts

A GROUP of five pape[rs] were presented covering portlan[d] cement, reactive cement-aggregate com[-]binations, vibrated dry-tamp concre[te] cylinders, white coat plaster, and pro[-]gressive heterogeneity of certain as[-]phalts. The first paper by H. [F.] Gonnerman and William Lerch, Por[t-]land Cement Assn., gave a compr[e-]hensive story of the changes in compo[si-]tion, fineness, and strength-produci[ng] characteristics of Type I portla[nd] cement as shown by laboratory tests b[e-]tween 1904 and 1950. The data sh[ow] that principal changes have been an i[n-]crease in the average computed C_3S co[n-]tent and an increase in fineness, each [of] which has contributed to higher co[n-]crete strengths at all ages up to ten yea[rs].

These changes occurred previous to 1933. Also included in the paper are data comparing composition, fineness, strength-producing characteristics, volume change, heat of hydration, and sulfate resistance of the five types of portland cement covered by ASTM Specification C 150.

A paper of much interest, by T. E. Stanton, California Division of Highways, described further studies to develop an accelerated test procedure for the detection of adversely reactive cement-aggregate combinations. The author has recommended that further attention be given to the effect which an increase in the normal percentage of water may have in accelerating the expansive reaction between the cement and aggregate. If the results of the California tests are verified by other agencies, it is expected there would be need for a modification in the current procedure defined in ASTM Tentative Method of Test for Determining the Potential Alkali Reactivity of Cement-Aggregate Combinations (C 227 T). S. B. Helms and A. L. Bowman, Lehigh Portland Cement Co., covered a method of making vibrated dry-tamp concrete cylinders applied to tests of lightweight aggregates and block mixtures. Three test series were reviewed, the first being on the effect of varied amounts of 100-mesh dust on density and strength of lightweight dry-tamp concrete; the second series dealing with the properties of dry-tamp expanded slag concretes made with plain and air-entraining cements; and the third series dealing with the properties of dry-tamp sand and gravel concrete made with plain and air-entraining cements. The authors believe that the results of these tests prove the utility of the inexpensive cylinder compaction device in testing lightweight aggregate, block mixtures, or concrete brick mixtures.

A Study of White Coat Plaster by Differential Thermal Analysis, by J. A. Murray and H. C. Fischer, Massachusetts Institute of Technology, noted that white coat plasters were prepared from sixteen commercial hydrated limes and subjected to differential thermal analysis at ages up to one year. One important conclusion to the study was that the results of this investigation neither discredit nor substantiate the theory which places the blame for plaster failures solely on the presence of unhydrated magnesia and its subsequent hydration to maximum hydroxide with disruptive conclusions. Several other factors should be considered, however, in connection with plaster failures, such as, the partial dehydration of gypsum on a wall as a function of temperature and humidity, the factors influencing precipitation conditions and the growth of precipitated particles, and the calcium compounds, their physical condition, and the chemical reactions in which they take part or are produced.

The concluding paper of the session dealt with progressive heterogeneity on aging, in naphtha sols of "Negative Spot Test" asphalts by G. L. Oliensis, Lloyd A. Fry Roofing Co. This paper is a follow-up to one presented by Mr. Oliensis ten years ago, describing a series of spot tests on different asphalts and asphalt blends. The new paper presented a tabulation of data during this ten-year period which verifies the conclusions previously drawn. The author supplements his thesis that the reactions of "partial solvents" on a bitumen are a criterion of its internal structure.

Chemical Analysis of Inorganic Solids by Means of the Mass Spectrometer

A SPECIAL technical papers session on the application of the mass spectrometer to the chemical analysis of inorganic solids was sponsored by Committee E-2 on Emission Spectroscopy. An attendance of about 100 gave evidence of the interest in the subject, which is less well known than the use of the mass spectrometry for analysis of gases and liquids.

The several papers, not preprinted, covered the special problems of mass spectrometer design and techniques required for analysis of inorganic solids and presented the results obtained in various specific applications.

The paper by J. A. Hipple, National Bureau of Standards, described a method of using direct electrical detection with a source employing a high-frequency spark. W. M. Hickam, Westinghouse Research Labs, described the mass spectrometric analysis of copper for use in cuprous oxide rectifiers and its correlation with rectifier performance. Mark G. Inghram discussed the use of isotopic tracers to achieve extreme sensitivity in analyses for traces of elements by means of the mass spectrometer. A paper was also presented by A. J. Cameron, Union Carbide and Carbon Corp.

The committee plans to recommend publication later this year of the above papers and the considerable discussion of them.

Papers on Concrete

THE six papers presented at the Seventeenth Session discussing concrete covered freezing-and-thawing tests, abrasion resistance, permeability tests, and sonic method for time of set.

Bailey Tremper discussed the effect of alkali content on the freezing-and-thawing resistance of concrete. With aggregates from a given source, the freezing-and-thawing resistance was found to be inversely proportional to the alkali content. However, the use of suitable air-entraining agents improved the resistance of concrete made with high-alkali cement to the point where it appeared to be equal to that of concrete containing low-alkali cement.

Price and Kretsinger described the apparatus and procedure employed by the Bureau of Reclamation at Denver for evaluating accelerated freezing-and-thawing tests of concrete. The correlation of results of the freezing-and-thawing tests with actual field service of similar concrete was discussed.

Walker and Bloem described a freezing-and-thawing apparatus developed by the Research Laboratory at the University of Maryland, under the sponsorship of the National Sand and Gravel Assn. and the National Ready Mixed Concrete Assn.

Properties affecting abrasion resistance of air-entrained concrete were covered by Witte and Backstrom. Some of the authors' conclusions were as follows:

1. Air content influences the resistance of concrete to abrasion but only in so far as it affects the compressive strength.
2. Compressive strength is the most important factor controlling abrasion resistance of concrete; abrasion resistance increasing as compressive strength increases.
3. For concretes of equal air content, the abrasion resistance is inversely proportional to the water-cement ratio.

Cook described apparatus and techniques for permeability tests of lean

Appreciation to Philadelphia District

This was the third consecutive year that the Philadelphia District sponsored the entertainment and social features of the meeting. Acting for the District, the Philadelphia Council arranged the annual dinner and underwrote separately all costs of the entertainment and dancing. The fine program for ladies' entertainment, which evoked many favorable comments, was planned and carried out entirely by the Council, with a Hostess Committee cooperating. The sincere thanks of the Board of Directors and all those at the meeting are tendered the Philadelphia District, especially its officers, for a job well done.

mass concrete. The concluding paper was by Whitehurst and covered the use of the Soniscope for measuring the setting time of concrete.

Symposium on Consolidation Testing of Soils

A Symposium on Consolidation Testing of Soils was the first of two sponsored by Committee D-18 on Soils for Engineering Purposes. Consolidation test data on peat were reported by James B. Thompson and L. A. Palmer, Bureau of Yards and Docks, Department of the Navy. Mr. Palmer described six samples taken of peat from a location on a site reclaimed from a tidal marsh, on which were built two earth-filled concrete barricades. Tests were reviewed and results plotted which indicate a straight-line relationship in the settlement rates of this particular material. W. G. Holtz, Bureau of Reclamation, gave a paper prepared by H. J. Gibbs and himself on consolidation and related properties of loess soils. Data were presented on physical characteristics and identification of loess soils, including gradation, specific gravity, plasticity, and petrographic analyses. In addition, data on physical and structural properties were reviewed, pointing out that the outstanding property of loess in this respect is that of high settlement. Permeability and shear were measured in relationship to settlement. Field performance of the loess soil foundations has been closely observed on numerous earth dams as they were built in order to correlate laboratory data.

A typical settlement problem which confronted the soil mechanics engineer in the Lower Mississippi Valley region was described by C. I. Mansur, joint author with W. G. Shockley, both of the Waterways Experiment Station, Corps of Engineers. Settlement of a railroad embankment crossing the Morganza Floodway, Louisiana, was discussed. It was found that observed settlements in the foundation occur at a somewhat faster rate than predicted by theoretical time-rate studies. Maximum computed settlements appear to be reasonable based on actual settlements observed to date. The care that should be taken in adequately sampling, testing, and evaluating soil conditions was stressed. L. H. Matlock and R. F. Dawson, University of Texas, described aids in the interpretation of the consolidation test. The paper included results on consolidation tests of extruded samples and recommendations pertaining to test equipment and procedure. Almost all consolidation testing at the University of Texas is done with the floating-ring type of consolidometer. A slope-fitting procedure is described which depends on the slope of a tangent to the test curve at the point of inflection. Slope fitting appeared to be a valuable aid in judging the probable agreement between actual and theoretical curves. R. H. Karol, Rutgers University, described a small compact machine capable of performing both consolidation and shear tests, which is known as a consolishear apparatus. The testing technique materially reduces the time required for gathering consolidation and shear strength data, with little or no sacrifice of the accuracy obtained by longer test methods on larger machines.

A study of the effect of temperature on the consolidation characteristics of remolded clay was reviewed in a paper by F. N. Finn, University of California. Certain conclusions drawn are that the coefficient of consolidation, as determined by the Terzaghi Theory and the log-of-time fitting method, does not vary appreciably with temperature in the range of 70 F. to 80 F., but does vary considerably from 70 F. to 40 F. Observed settlements of highway structures due to consolidation of alluvial clay, along the Potomac River, were presented by E. S. Barber, Bureau of Public Roads. Primary consolidation based on soil permeability and location of drainage boundaries, followed by secondary consolidation is described. Total settlements indicated by field observations were in substantial agreement with the values calculated from laboratory tests. The paper by D. M. Burmister, Columbia University, was concerned with certain basic principles and concepts of controlled test methods. The author illustrated the potentialities and possibilities in consolidation testing, wherein essential controlling conditions and test conditions are emphasized in several projects. Each project is analyzed in terms of the controlling conditions in the natural situation, conditions imposed by the structure and by construction, test conditions, and a comparison of observed and predicted settlements.

Effect of Temperature on Metals

At least nine papers presented at the Annual Meeting concerned the effect of temperature on metals. Six of these were in the Fourteenth Session at which there were also reports of the Committees on Steel, Cast Iron, and Corrosion of Iron and Steel, as well as the Joint Committee on Effect of Temperature on Metals. In addition there were three papers covering creep properties of aluminum alloys presented as part of the Eighteenth Session.

It is not news to anyone active in this field that the Research Laboratory of the U. S. Steel Co. at Kearny has under way extensive work involving effect of temperature. Four papers, authored by men from this laboratory, were given in this session. Messrs. Smith, Dulis, and Houston gave considerable data on the Creep-Rupture of Several Sheet Steels. There were three materials annealed 18 Cr – Ni – Mo at 1100, 1300, and 1500 F.; annealed and half-hard 17 Cr – 7 Ni at 600 and 100 F and cold-rolled 4608 (Ni – Mo) at 600 F. Careful attention was given to the grips for the creep rupture specimens. For the 316 type annealed, tensile strength ranged from 24,000 psi at 1500 F to 81,000 psi at room temperature. Elongation in 2 in. increased from 36 per cent at 600 F to 60 per cent at 1500 F which is about the same as at room temperature. Except for the cold-rolled material, there was a marked drop in tensile strength at 600 F compared with the room temperature properties. Test results in the longitudinal direction of annealed and half-hard 17 Cr – 7 Ni steel at 600 and 1100 F show appreciable superiority over the cold-worked metal at 600 F and for relatively short rupture times at 1100 F. With increase of rupture time at this latter temperature, the superiority of the cold-worked metal is diminished, though still evident at 5000 hr. The test result on 17 Cr – 7 Ni and 4608 at 600 F suggest that creep data are probably no needed for design in either case.

In another paper, Messrs. Smith, Seens, Link, and Malenock described the effect of exposure for 10,000 h (about 14 months) at 900, 1050, or 120 F on microstructure, hardness at room temperature, and notch-impact strength at different temperatures of 18 ferritic o austenitic steels which may be applied i service at elevated temperatures. I the low-alloy ferritic steels, carbid spheroidized and a fine precipitate de veloped. No graphitization was noted Alloys containing 5 Cr, ½ Mo (Ti) or Cr, 1 Mo showed no significant change in microstructure. Carbide sphero dized in the 12 Cr, and 17 Cr grades, an in the latter sigma precipitated in the 1 Cr – 8 Ni (Mo, Cb), 18 Cr – 8 Ni (Ti and 18 Cr – 8 Ni (Cb) grades and ca bide in the remaining grades includin the 0.03 (max) carbon grades.

The notch toughness of four allo steels at low temperatures was covere by Messrs. Seens, Jensen, and Mille Temperatures ranged from room down t −315 F. Notch toughness was dete mined by the Charpy keyhole test o steels containing nominally 2.5 per ce nickel (2215), 3.5 per cent nickel (2317 3.5 per nickel, and 0.25 per cent moly denum (4815) and 9 per cent nick (2810) were used. Specimens were take from ½-in and 2-in. plates, with son from tubing.

Notch toughness of all four steels d

creased gradually at first as the test temperature was lowered. For the three lower-alloy steels, this gradual decrease was followed by a more abrupt drop at relatively low temperature. For these plates which were not cross-rolled, Charpy values were considerably higher for longitudinal specimens than for transverse specimens, except at low temperatures where both were relatively brittle. Notch toughness at low temperature was greatly improved by suitable heat treatment. In general, normalized plate was better than hot-rolled plate, and quenching and tempering resulted in further improvement.

In a companion paper on notch toughness of fully hardened and tempered low-alloy steels, Messrs. Rickett and Hodge found that in these materials quenched entirely to martensite and then tempered, low-carbon steels were found to be tougher than higher-carbon steels when the latter were tempered at some higher temperature to produce the same hardness. This conclusion is based on statistical analysis of data, including some from other sources, representing a large number of impact tests at room temperature, made on steels containing approximately 0.10 per cent to 0.65 per cent carbon.

R. W. Emerson of Pittsburgh Piping and Equipment Co. pointed out that two grades of material which have been used for steel piping to operate at 1000 F to 1050 F Central Station Service, namely, the 2.25 per cent chromium, 1.0 per cent molybdenum (A 213, Grade T22), and 3.0 per cent chromium–1.0 per cent molybdenum steel (A 213, Grade T21) are really air hardening steels, and hence close procedure control must be exercised in fabrication.

Robert J. Mosborg, University of Illinois, described interesting apparatus for low-temperature tension tests of metals. With the use of a bath of liquid nitrogen for tests at −321 F and a bath of Freon 12 cooled with liquid nitrogen for tests between −90 F and −230 F, the testing procedure proved to be both convenient and efficient. The author noted that to complete a test at −321 F using a steel specimen about 7 lb of liquid nitrogen was required with the test time of $\frac{1}{2}$ hr.

Fatigue (and Non-Ferrous Metals)

Two sessions of the Annual Meeting were devoted entirely to papers on fatigue while a third session contained papers which were of interest to men in the fatigue field.

At the Fourth Session, Monday evening, June 18, G. R. Gohn presented a paper, coauthored with W. C. Ellis, on "The Fatigue Test as Applied to Lead Cable Sheath." This paper discussed the more important factors affecting the design of laboratory test methods suitable for obtaining fatigue data on lead cable sheathing alloys. Data were presented to show the effect of cycling rate, temperature, shape of specimen, alloy additions, and aging on fatigue life. The close correlation between fatigue tests on stress specimens and full-size sections of cable was demonstrated.

Another paper, "The influence of Frequency on the Repeated Bending Life of Acid Lead," was presented by John F. Eckel. He showed from test results at 110 F that a definite relation exists between frequency and the bending life of acid lead between 0.27 and 0.65 per cent maximum strain per cycle and between 6.63 and 7440 cycles per day. Extrapolation indicated a bending life at one cycle per day that was shorter than that found under service conditions. This discrepancy and differences between laboratory tests and service conditions were discussed.

The third paper on lead was that by G. M. Bouton and G. S. Phipps, "Compression Tests on Lead Alloys at Extrusion Temperatures." Load-deflection measurements made during compression tests on lead and lead alloy cylinders at various temperatures showed the effects of alloy ingredients on the force required to produce deformation. The elements added to the lead included antimony, arsenic, bismuth, silver, tellurium, and tin. The results showed that these stronger alloys now used for cable sheathing deform less readily at extrusion temperatures than pure lead or the weaker alloys.

The paper on "The Influence of Cold Work and Heat Treatment on the Engineering Properties of Beryllium Copper Wire," prepared by J. T. Richards, R. H. Levan, and E. M. Smith and presented by Richards, pointed out the marked effects upon tensile strength, proportional limit, ductility, and tension modulus resulting from variations in grain size, preferred orientation, straightening, overstraining in tension, and stress relieving.

R. J. Mosberg presented the paper on "Fatigue Tests in Axial Compression" prepared in collaboration with N. M. Newmark, W. H. Munse, and R. E. Elling. Exploratory studies conducted on gray cast iron, 24S-T aluminum alloy, and steel showed that in general, compression failures occurred only under high stresses. In A7 steel, for example, failures were not observed at less than five million cycles until stresses in the neighborhood of 85,000 psi were applied. These results, under nearly uniformly distributed axial compressive loads, are in distinct contradiction to results obtained with notch specimens or with repeated bending tests.

The paper by Irving Roberts, "Prediction of Relaxation of Metals from Creep Data," noted that in recent years evidence has been accumulating to show that relaxation rates of metals can be predicted from tension creep data by means of the strain-hardening assumption. This has been accompanied by considerable controversy, and Roberts' paper presented a theoretical discussion designed to help clarify some of the confusion which has existed in this field. A study of experimental data is given showing that the strain hardening assumption yields accurate results for copper, carbon steel, and for the alloy S-816.

Statistical Reports:

The Seventh Session, held Tuesday morning, June 19, dealt with the statistical aspects of fatigue. The first of three papers in this session was on "Planning and Interpretation of Fatigue Tests" by A. M. Freudenthal. This paper attempted to derive a cumulative frequency distribution function $P(N)$ of the fatigue life, N, at any particular stress amplitude, S, from considerations of statistical theory, which, as a first approximation, leads to a logarithmic-normal distribution function of N. From the so-plotted accumulative distributions $P(N)$ of the fatigue life of aluminum at a number of stress amplitudes, S, a complete three-dimensional S-N-P relation was obtained.

F. B. Stulen's paper, "On the Statistical Nature of Fatigue," developed hypotheses to explain the effect of size on endurance limit, fatigue life, and notch sensitivity. Experimental tests of some of these hypotheses led to the conclusion that the endurance limit of the materials varies from specimen to specimen and is best characterized by means of a frequency distribution.

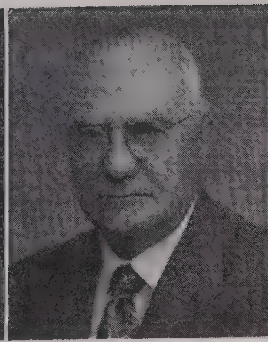
Robert Plunkett, in his paper, "Statistical Analysis of Fatigue Data," dealt with a statistical analysis of the experimental data and gave a method for plotting the curves of a constant which represented the fraction of the total number of specimens that fell at or below a certain number of cycles.

The interest in this particular session was manifested by the fact that discussions of the papers averaged 30 to 40 min each. The papers in this session on "Statistical Aspects of Fatigue" will be incorporated in a special technical publication.

The last of the three fatigue sessions was presented Tuesday evening, June 19. R. E. Peterson opened the session by briefly outlining the work of Committee E-9 on Fatigue. He pointed out specifically that 13 papers had been accepted for presentation at the Annual Meeting and that the committee had prepared 11 research problem state-

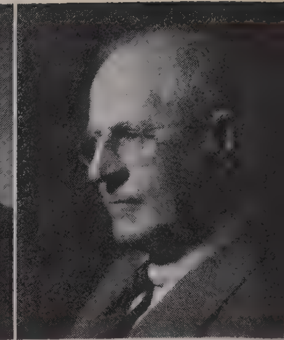
(continued on page 18)


R. A. Schatzel


Stanton Walker


F. P. Zimmerli


J. W. Bolton


E. O. Slater

New ASTM Officers

THE election of officers, as announced at the Annual Meeting, resulted in the election of Truman S. Fuller as President (1951–1952), Leslie C. Beard, Jr., as Vice-President (1951–1953), and the following as Directors (1951–1954): John W. Bolton, Rudolph A. Schatzel, E. O. Slater, Stanton Walker, and F. P. Zimmerli.

President

TRUMAN S. FULLER, the new President, is Engineer in Charge of Works Laboratory, General Electric Co., Schenectady, N. Y. Born in Saratoga Springs, N. Y., Mr. Fuller graduated from Syracuse University in 1911 with a degree of B.S. in Chemistry. He entered the employ of the General Electric Co. as Chemist at the Edison Lamp Works, Harrison, N. J., on July 1, 1911. Three months later he was transferred to the Research Laboratory as Metallurgist at Schenectady. In 1938 he became Engineer of Materials, Works Laboratory; in 1943 Assistant Engineer of that division; and on July 1, 1945, was appointed Engineer in Charge of the Works Laboratory.

Participating in ASTM work for many years, he is a former member of the Board of Directors, having served in 1939–1941 and again 1947–1950. He was elected Vice-President last year. He has been an active member of a large number of ASTM technical committees in many materials fields. A long-time member of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys, he served as Chairman of this important committee from 1926 to 1940. During this period the committee inaugurated many extensive corrosion tests. These involved the exposure to atmosphere in various locations throughout the United States of thousands of specimens of non-ferrous metals and alloys. The committee also conducted important outdoor exposure tests of coupled materials involving galvanic and electrolytic corrosion. Other technical work in which he has been and is still active includes steel, cast iron, corrosion of iron and steel, stainless alloys, and radiographic testing. He has served on Committee A-1 on Steel since 1938, being concerned particularly with the use of materials at elevated temperatures. For many years he served on the Research Committee on Fatigue of Metals.

A writer of many papers, particularly on metals and alloys, Mr. Fuller also is active in the work of other technical organizations and holds membership in the following: American Society for Metals, American Institute of Mining and Metallurgical Engineers, the British Institute of Metals, and the British Iron and Steel Institute.

Vice-President

LESLIE C. BEARD, JR., the new Vice-President, is Assistant Director of Socony-Vacuum Laboratories, Socony-Vacuum Oil Co., Inc., New York, N. Y. Hagerstown, Md., was the birthplace of Dr. Beard who received his A.B. from Johns Hopkins University in 1919 and his Ph.D. in 1922. Following a period on the faculty of the Baltimore College of Dental Surgery and then as Instructor of Chemistry at Johns Hopkins University, Dr. Beard became Research Chemist of the Standard Oil Co. of New York in 1923. Later he was Supervisor of Research and since 1933 has been Assistant Director of the Socony-Vacuum Laboratories. (In 1918 Dr. Beard was in the Chemical Warfare Service.)

A member of ASTM for many years, he has been particularly active in Committee D-2 on Petroleum Products and Lubricants. He has been Chairman of several of the subgroups; currently he is First Vice-Chairman of the main committee. Technical committees on which he has membership cover gasoline, turbine oils, and illuminating oils. He is also active in research work on flow properties. He serves on the New York District Council and is a member of the ASTM Administrative Committee on Research.

His other memberships in addition to ASTM are the American Chemical Society, American Petroleum Institute, American Association for the Advancement of Science, and Phi Beta Kappa.

New Members of Board of Directors

John W. Bolton, Director of Metallurgical Research and Testing, The Lunkenheimer Co., Cincinnati, Ohio, was born in Terre Haute, Ind., and received his B.Sc. from Rose Polytechnic Institute in 1918 and his M.Sc. in 1921. Prior to his affiliation with the Lunkenheimer Co. in 1927 he had a period of service with Procter & Gamble Co., Niles-Bement-Pong Co., and Frank Foundries Corp.

Mr. Bolton has a record of intensive service on several ASTM technical committees. Chairman of Committee A-3 on Cast Iron for two terms, he had a leading part in the development of its Specification A 48 which sets up specific strength classifications for gray iron castings. He serves on several of the A-3 subcommittees. Likewise on Committee B-5 on Copper and Copper Alloys, where he has been concerned particularly with cast products, he serves on several subgroups and has been Vice-Chairman of the main committee. Formerly on the Administrative Committee on Research he has been an active member for many years of Committee A-1 on Steel, and also of the ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals, serving for several years as Secretary of this group. He serves on the Ohio Valley District Council which he helped to organize.

A prolific writer, Mr. Bolton has authored several ASTM papers and presented many before other technical and scientific organizations. In the American Foundry Society he was the 1937 Penton Gold Medalist, and presented several important lectures. His other memberships include American Society for Metals, American Institute of Mining and Metallurgical Engineers, Ohio Society of Professional Engineers, and the Engineering Society of Cincinnati.

Rudolph A. Schatzel, Vice-President and Director of Engineering, Rome Cable Corp., Rome, N. Y., was born in Kingston, N. Y., attended Schenectady High School, received his B.S. in Chemistry from Union College in 1921; his M.S. in 192[illegible]. He was Research Chemist, General Electric Research Laboratory, and later took graduate work and instructed at M.I.T. In 1924 he was Assistant Research Director, Rome Wire Co., and from 192[illegible] to 1935 was Technical Director of General Cable Corp.; then for ten years was Director of Research in Rome and Bayonne, N. J. Since 1945 he has been Vice-President and Director of Engineering, Rome Cable Corp.

In ASTM, Mr. Schatzel has been particularly active in Committee D-11 on Rubber and Rubber-like Materials where he holds membership on several subcommittees and was for many years Chairman of Subcommittee V on Insulated Wire and Cable. He also serves on Committee B-1 on Wires for Electrical Conductors.

During World War II he was very active in the War Production Board; was Chairman of Industry Consulting Committee for Rubber Insulation. He served as Chairman, Wire and Cable Industry Advisory Committee for Navy Shipboard Cables.

Mr. Schatzel has written many technical papers, holds numerous patents, and has contributed to various textbooks in his field. His memberships include the American Chemical Society, American Institute of Chemists, American Institute of Electrical Engineers, American Society for Metals, American Institute of Mining and Metallurgical Engineers, Society of Naval Engineers, British Institute of Metals, British Institute of Rubber Industry, and Insulated Power Cable Engineers Assn.

E. O. Slater, President and Manager, Smith-Emery Co., Los Angeles, Calif., was born in Creston, Iowa, and has lived in California since the age of five. His technical training was obtained at the University of California, Berkeley, where in 1908 he received his degree in chemistry. His entire business career has been with Smith-Emery Co. Following two years in the San Francisco office, he became manager of the company's Los Angeles office and laboratories and has managed this organization for 41 years. His activities have involved design and appraisal work, inspection and testing, chemical control and development of products in a wide variety of industries.

He has been a member of ASTM for many years and served as Secretary of the Southern California District Council 1934–1942, Vice-Chairman 1942–1944, and Chairman 1944–1946.

He has been active in many other technical and business groups; is a Past-Chairman of the Southern California Sections of both the American Chemical Society and the American Institute of Mining and Metallurgical Engineers. He is also a member of the American Water Works Assn., and is a Past-President of the Mining Association of the Southwest. He has been a member of the Board of Directors of the Los Angeles Chamber of Commerce and has been active in various Chamber of Commerce committees including construction, manufacturing, industry, and mining.

Stanton Walker is Director of Engineering, National Sand and Gravel Assn., Washington, D. C. A native of Indiana (birthplace Vevay) he attended the University of Illinois, receiving his B.S. in 1917. He was Research Engineer for the Portland Cement Assn., Chicago, 1917 to 1926; since then has been in his present position. He directs his Association's Research Foundation at the University of Maryland; and is Director of Engineering, National Ready Mixed Concrete Assn.

Active in ASTM work for many years, Mr. Walker has a notable record of service on several technical committees, in particular Committee C-9 on Concrete and Concrete Aggregates where he has been a member for some 25 years, serving as Secretary 1926–1932 and again 1942–1951. Other ASTM committees where he has a long record of service include D-4 on Road and Paving Materials and C-12 on Mortars for Unit Masonry. A former Director (1940–1942) he served on the Society's Committee on Papers and Publications for six years, and currently is a member of the Washington, D. C., District Council. In recognition of his notable work in ASTM the Board of Directors will tender him a 1951 Award of Merit.

Mr. Walker is a Past-President of the American Concrete Institute; was formerly Chairman of the Highway Research Board; and is a member of the American Institute of Mining and Metallurgical Engineers. He has written widely, including many technical articles and papers dealing with his field of work.

F. P. Zimmerli is Chief Engineer, Barnes-Gibson-Raymond, Division of Associated Spring Corp., Detroit, Mich.

ASTM Member R. Schlyter from Sweden Welcomed by President L. J. Markwardt.

Following his graduation from University of Michigan in 1917 (where his Master's degree was procured in 1920 and Metallurgical Engineer degree in 1934) Mr. Zimmerli was employed in the metallurgical departments of Solvay Process Co., Dodge Brothers, and Rickenbacker Motor Co. He has been Chief Engineer of his present company for over 25 years.

In ASTM he serves on Committee A-1 on Steel and its Subcommittee IV on Spring Steel and Steel Springs. He is a member of Committee E-9 on Fatigue and formerly served on Committee B-4 on Electrical Heating, Resistance and Related Alloys. He has been a member of the Detroit District Council since 1939 and is a Past-Chairman of that District.

With respect to other organizations Mr. Zimmerli is currently Vice-President, Engineering Materials, Society of Automotive Engineers; also Vice-President of the Engineering Society of Detroit. He holds membership in American Society of Mechanical Engineers, American Chemical Society, and American Society for Metals. In 1947 he received a high honor from ASM for outstanding metallurgical achievement when he was given the Albert Sauveur Award.

40-Year Members

At the Luncheon Session on Tuesday, June 19, one of the interesting events was the recognition of individuals and companies that have been connected with the Society continuously for 40 years. Those present at the meeting (see accompanying photograph for group) were given the 40-Year Certificates, and the others have been mailed.

A list of the "new" members entering the 40-Year Club this year follows:

American Locomotive Co.
Baldwin-Lima-Hamilton Corp.
Bridgeport Brass Co.
Brown & Sharpe Mfg. Co.
Carnegie Institute of Technology
General Motors Corp.
S. H. Graf
Hercules Cement Corp.
S. H. Ingberg
Ledoux and Co., Inc.
J. O. Leech
J. H. Nead
R. H. Noderer
Northern Electric Co., Ltd.
Monroe L. Patzig
Pratt & Lambert, Inc.
W. P. Putnam
Louis G. Robinson
The Steel Co. of Canada, Ltd.
U. S. Department of the Navy, Bureau of Aeronautics
U. S. Department of the Navy, Bureau of Ordnance
U. S. Department of the Navy, Bureau of Ships, Code 350
United States Gypsum Co.
U. S. Naval Engineering Experiment Station
Herbert L. Whittemore
Lucien I. Yeomans

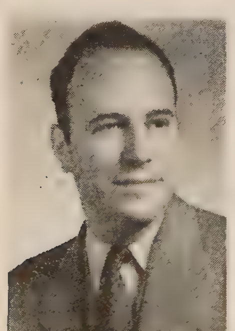
Forty-Year Members and Representatives of Forty-Year Company Members.

The 1951 group of Forty-year members are particularly interesting because four branches of the U. S. Dept. of the Navy were recog-nized. Front row from left to right: Commander P. T. Coil, representing U. S. Naval Engineering Experiment Station; Alan Morris, Director of Research, representing Bridgeport Brass Co.; Commander T. M. Bennett, U. S. Navy, representing Bureau of Aeronautics; James Taylor, Metallurgical Engineer, representing American Locomotive Co.; S. H. Ingberg (ret.) formerly with National Bureau of Standards.

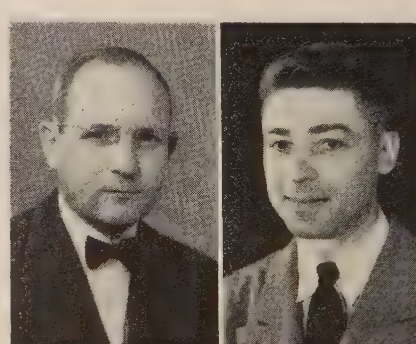
Back Row from left to right: Past-President T. A. Boyd, Consultant, representing General Motors Corp.; Captain W. C. Latrobe, U. S. Navy, representing Bureau of Ships, which Bureau has taken a most active and constructive part in many ASTM technical com-mittee activities; Francis G. Tatnall, Manager of Testing Research, representing Baldwin-Lima-Hamilton Corp.; Lewis Pierre Ledoux, President, representing Ledoux & Co., Inc.; M. D. Baker (Pittsburgh) pinch-hitting for Frederic T. Mavis, Head, Dept. of Civil Engi-neering for the Carnegie Institute of Technology; William L. Lutz, Technical Director, representing Pratt & Lambert, Inc.; J. Hunter Nead, Metallurgical Consultant to the President, representing Inland Steel Co.; Rear Admiral M. F. Schoeffel, Chief of Bureau of Ord-nance, U. S. Navy, representing the Bureau. A complete list of Forty-year members for 1951 is given in the accompaning article.

R. L. Templin W. C. Aber
Templin Award Winners

L. P. Mielenz C. J. Glantz L. P. Witte
Thompson Award Winners



C. T. Evans, Jr.
Sam Tour Award Winner



D. S. Clark P. E. Duwez
Dudley Award Winners

Five Honorary Memberships Awarded

Messrs. Thomas G. Delbridge, Albert T. Goldbeck, Harold H. Morgan, Frank E. Richart, and Frederick W. Smither Honored

In recognition of their meritorious services to the Society over long periods of time and their eminence in the field of work in which the Society is engaged, five long-time ASTM members were awarded Honorary Memberships during the 1951 Annual Meeting. All of these men—Thomas G. Delbridge, Albert T. Goldbeck, Harold H. Morgan, Frank E. Richart, and Frederick W. Smither—are outstanding in their respective fields and it was considered most fitting that they should receive the highest honor the Society bestows.

President L. J. Markwardt gave the recipients their membership certificates following citations given by Executive Secretary Warwick. Biographical information on each of the five new Honorary Members follows.

Thomas Gerard Delbridge

Now retired and until recently manager of the Research and Development Department of the Atlantic Refining Co., Doctor Delbridge is a graduate of Union College, 1903. For five years he was instructor in chemistry at Cornell University where he received his doctorate in 1907.

Leaving scholastic halls in 1909 he went with the Atlantic Refining Co. in Philadelphia, serving as chemist, assistant plant manufacturer, process supervisor, and finally manager of the research and development department. Under his guidance and leadership, research activities in his company came to embrace a wide field of petroleum studies to which he contributed especially in development of distillation methods, solvent refining (the nitrobenzene process), wax manufacturing, and methods of analysis. He has written extensively on petroleum refining subjects (and contributed to the chapter on testing methods in Day's Handbook of the Petroleum Industry).

Affiliated with the Society since 1919, Doctor Delbridge has rendered valuable service in both technical and administrative work. His technical activities have been concentrated in Committee D-2 on Petroleum Products and Lubricants, of which he was Vice-Chairman for many years, and where his wise counsel and sound advice contributed immeasurably to the success of that committee's work. He was elected an honorary member of the committee in 1947. He was also for some years a member of the Committee on Electrical Insulating Materials.

On the administrative side his contributions have been outstanding. In addition to service on the Administrative Committees on Standards and on Papers and Publications, he served as a member of the former Executive Committee, 1923–1925, was Vice-President, 1936–1938, and President of the Society, 1938. Although his leadership in Society affairs has been expressed in many fields, certainly one of the outstanding has been his wise guidance of the Society's finances. He also contributed most ably to the work of a special Study Committee which some years ago made an intensive study of Society operations and proposed important changes in organization and policy.

Among other affiliations are the Franklin Institute, the American Petroleum Institute, and the British Institute of Petroleum Technologists.

Albert Theodore Goldbeck

Engineering Director of the National Crushed Stone Association, Mr. Goldbeck is a graduate of the University of Pennsylvania, 1906. Following several years of teaching at Pennsylvania and Lafayette College and a period as testing engineer for the City of Philadelphia, he was connected with the Bureau of Public Roads and Rural Engineering in charge of nonbituminous materials and highway engineering investigations. Later he became chief of the Division of Tests of that Bureau until 1925, when he assumed the position he now holds.

His membership in ASTM started in 1910, and in the 41 years of association with the Society he has contributed an enormous amount of work in its committees. Thus he served on the Cement Committee for 18 years, the Mortar Committee for six years, and on the Soils Committee for 10 years. He has been on Committee C-9 on Concrete and Concrete Aggregates since its organization in 1914, serving as both chairman and secretary and he has likewise been an active participant in the work of Committee D-4 on Road and Paving Materials, this affiliation dating from 1912; he has been a vice-chairman of the committee for 20 years and has made valuable contributions to both the technical and administrative affairs of the committee. He was a member of the former Executive Committee, 1938–1940, and is now a member of the Washington District Council.

He has made many contributions to the technical literature on road materials and highway and bridge design, and has developed various laboratory apparatus, including a soil pressure cell, a graphic strain gage, and a road materials testing track.

He is a member of the American Society of Civil Engineers, American Concrete Institute, American Railway Engineering Association, and a number of others, and his qualities of leadership have also been expressed through chairmanship of the Highway Research Board of the National Research Council.

Harold Hudson Morgan

Mr. Morgan is a graduate of Lewis Institute, Chicago, and began his career in 1904 with the firm of which he is now Vice-President and Chief Engineer, namely Robert W. Hunt Co. For this nearly half a century he has been closely associated with the problems of testing and inspection of a wide variety of materials. At first in charge of miscellaneous inspection for his company, he has been for varied periods manager of the physical testing and cement testing laboratories, manager of the company's Pittsburgh office and district, also of its rail and fas-

T. G. Delbridge

A. T. Goldbeck

H. H. Morgan

F. E. Richart

F. W. Smither

tenings department and its cement, concrete, and engineering departments. During World War I he represented his company on war materials inspection for the Engineer Corps of the Army, becoming Captain in 1918. In the past year he has assumed the duties of General Manager of his company.

His services to the Society since he joined ASTM in 1924 have been extensive. While he has served on many technical committees, his greatest technical activity has centered in Committee A-1 on Steel, of which he has been both vice-chairman and chairman, a member of its Advisory Committee and chairman at various times of the subcommittees on pipe, reinforcement bars, and presently on steel rails and accessories. His other committee affiliations include those on ferro-alloys, fire tests of materials and construction, and Methods of Testing.

His contributions to the administration of Society affairs have been noteworthy. He was a member of the former Executive Committee, 1935–1937, Vice-President, 1937–1939, and President, 1939–1940. He has been a member of the Chicago District Council for many years and has taken an active interest in the work of the Administrative Committee on Ultimate Consumer Goods. A noteworthy contribution is his representation of ASTM in the work of the American Standards Association, where he has served as member of the Standards Council and a number of ASA sectional committees, and as a Director of ASA for a number of years.

Other society affiliations include American Society of Mechanical Engineers, Western Society of Engineers, American Railway Engineering Association, and American Society for Metals.

Frank Erwin Richart

Research Professor of Engineering Materials, University of Illinois, Mr. Richart received his engineering education at that institution with Bachelor, Master, and Civil Engineering degrees. Following various types of engineering work in the railroad field, he joined the faculty of his Alma Mater in 1916 in the Department of Theoretical and Applied Mechanics. He is one of the country's outstanding authorities in the field of concrete and reinforced concrete; and while perhaps most of his technical accomplishments are in that field he has carried out much research on other materials. He is the author of numerous technical papers and reports, many of which have been published by this Society.

A member of ASTM since 1918, he has served on many of our committees. His longest record of service is on Committee C-9 on Concrete and Concrete Aggregates, of which he has been a member since 1922, chairman, and now an honorary member. He had a long record of service on the Joint Committee on Concrete and Reinforced Concrete, including vice-chairmanship, and he has served on such other committees as those on brick, fire tests, and methods of testing building construction.

On the administrative side he has served effectively as member of the Committees on Papers and Publications and on Standards. He has served two terms as Director of the Society, 1936–1938, 1946–1949, and is currently Vice-President of the Society.

True to his professional ideals he has been active in many engineering and technical organizations. He is a past-president and honorary member of the American Concrete Institute, its 1938 Wason medalist, and recipient (1950) of the first A. E. Lindau award of that Institute "for his years of labor toward the improvement of reinforced concrete design practice." Other society memberships include American Society of Civil Engineers, Western Society of Engineers, and Society for Experimental Stress Analysis.

Frederick W. Smither

Mr. Smither, after graduation from Virginia Polytechnic Institute in 1895 and graduate work at the University of Virginia, was chemist in various companies including the Virginia Iron, Coal and Coke Co. In 1907 he was employed in the Federal Government first as chemist in the U. S. Department of Agriculture, and from 1914 to 1946 at the National Bureau of Standards where through the years he engaged in such work as analysis of platinum metals and chemical reagents, and later was chief of the section handling detergents, cement, and silicate analysis and a variety of miscellaneous materials. (He served long and effectively in the work of the Federal Specifications Committee on Detergents and Fire-Extinguishing Liquids.)

Joining ASTM in 1912, Mr. Smither has been active in committees on lime, paint, petroleum products, general methods of testing, and, in recent years, Committee D-12 on Soaps and Other Detergents. He was one of the organizers of this committee in 1936 and perhaps his most important contribution to the Society has been in this field. He was vice-chairman of the committee for ten years, chairman for two years, and in 1951 was elected Honorary Chairman.

Other memberships include American Chemical Society, Chemical Society of Washington, of which he is a past-president, American Oil Chemists Society, and the American Association for the Advancement of Science.

Awards of Merit Conferred for Outstanding Service

Ten ASTM Men Honored

For outstanding and long-time service to the Society, especially in certain technical areas, ten men who have worked in the Society for many years were signally honored at the Annual Meeting by receiving Awards of Merit from the Board of Directors. These men are as follows:

William Blum
Hyman Bornstein
Robert Burns
Harry Van Osdall Churchill
Max Hecht
Carl DeWitt Hocker
William Henry Klein
Horace Hardy Lester
Stanton Walker
William Henry Whitcomb

L. A. Winkler, Chairman of the Committee on Award of Merit, presented the awards, and brief citations were read as each received his certificate.

The Award of Merit was established by the Board of Directors in 1949 as a means of recognizing individuals who have rendered distinguished service to the Society, particularly as their activities have involved the various technical committees. Each technical committee under the rules governing the Award may suggest one candidate, and these suggestions together with others are then reviewed by an Award of Merit Committee which makes nominations to the Board of Directors. There is a limitation on the number of Awards which may be granted each year.

There are various types of service which can be considered in proposing candidates.

The form of the Award consists of an appropriate certificate duly authenticated with the Society seal.

Citations

The following citations will give some idea of the services which are recognized by the 1951 Awards. Each of the men honored has rendered service along many lines of activity but his work was particularly intensive in the field noted in the citation.

William Blum:

To William Blum, Chief of the Electrodeposition Section and Assistant Chief of the Chemistry Division, National Bureau of Standards, Washington, D. C., in recognition of pioneering research leading to development of a widely used group of specifications for electrodeposited coatings which in large measure have been responsible for improved quality of plated materials. His early work, which was continued in Committee B-8 on Electrodeposited Metallic Coatings, resulted in a much better knowledge of plating and plating solutions, and consequently has had a most important bearing on this segment of American industry.

William Blum

Hyman Bornstein

Robert Burns

H. V. Churchill

Max Hecht

Hyman Bornstein:

To Hyman Bornstein, Chief Technical Consultant, Deere and Co., Moline, Ill., for his long-time and constructive service to the Society, notably in the fields of cast iron and malleable iron. He has been a member of Committee A-3 on Cast Iron for many years and its Chairman for eight years. Under his leadership research was completed and standards were prepared for cast iron that have brought cast iron to a definitely higher plane as an engineering material. By the stimulation of technical papers and symposiums, and in other ways, Mr. Bornstein has made outstanding contributions to the Society's work.

Robert Burns:

To Robert Burns, Member of Technical Staff, Bell Telephone Laboratories, Inc., Murray Hill, N. J., for notable service to the Society in the field of plastics and electrical insulating materials. As Chairman of Committee D-20 on Plastics during the period 1942–1948, when the use of these materials was being tremendously expanded, many in strategic applications, he guided the work of the committee so that its researches and its many test methods and specifications insured sound use of the materials. During the war period his guidance of several ASTM advisory groups to the military departments on important problems in plastics was outstanding. His valuable contributions to our knowledge of the properties of plastics and his other work have brought wide recognition to ASTM for sound technical achievements in this field.

Harry Van Osdall Churchill:

To Harry Van Osdall Churchill, Head, Analytical Division, Research Laboratories, Aluminum Company of America, New Kensington, Pa., noted authority on chemical and spectroscopic analysis, for outstanding service in the organization of Committee E-2 on Emission Spectroscopy, of which he was Chairman for 14 years, and for his pioneering leadership in formulating methods of spectroscopic analysis by emission techniques which have brought world-wide recognition to Committee E-2 and the Society. By stimulating counsel and foresight, Mr. Churchill led this committee in its sponsorship of important symposiums, valuable to workers in this field, and in the development of important data on standard samples, essential in spectrochemical procedures.

Max Hecht:

To Max Hecht, Adviser, Power Stations Chemistry, Drexel Hill, Pa., for notable service in Committee D-19 on Industrial Water, of which he has been Chairman since its organization in 1932, and where his intense concern with its activities, his profound technical knowledge, and his understanding of technical men, have been responsible in large measure for the many achievements of this committee. By his stimulation of technical papers and programs, his constant interest in research, and a steady pressure to produce needed test methods, Mr. Hecht has contributed immeasurably to better utilization by industry of this important natural resource.

Carl DeWitt Hocker:

To Carl DeWitt Hocker, Associate Professor of Chemistry, Union College, Schenectady, N. Y., and long-time member of the technical staff, Bell Telephone Laboratories, for his distinctive service to the Society in the field of corrosion. He has been a member of Committee A-5 on Corrosion of Iron and Steel for over 25 years and is a Past-Chairman. In the work of the Society involving corrosion, and in other fields, he has exhibited a thoroughness and a willingness to work which, combined with a practical approach to the general problem of deterioration and a clear conception of the significance of long-range exposure tests, has aided in producing data of widespread significance, and has immeasurably enhanced the Society's reputation for outstanding work in this field.

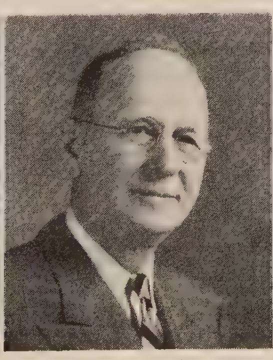
William Henry Klein:

To William Henry Klein, Vice-President and Operating Manager, Lawrence Portland Cement Co., Northampton, Pa., for outstanding service to the Society for 40 years, notably in Committee C-1 on Cement. As an officer of this committee and as a member and officer of several of its subcommittees he contributed constructively and effectively to the development of both methods of test and specifications for cement. His inspiring leadership and judgment have been important assets in his work for Committee C-1 and the Society.

Horace Hardy Lester:

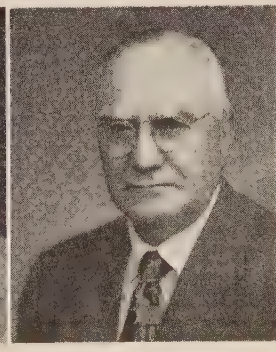
To Horace Hardy Lester, Principal Physicist, Watertown Arsenal, Watertown, Mass., for his pioneering efforts in the field of industrial radiography and for his leadership in forming Committee E-7 on Non-Destructive Testing which he headed from its establishment in 1938 to 1948. His stimulation of research work in several fields of nondestructive testing, his encouragement of other workers, and his interest in the committee sponsorship of technical papers and symposiums, have resulted in rendering valuable assistance by the Society to industry and government.

C. D. Hocker

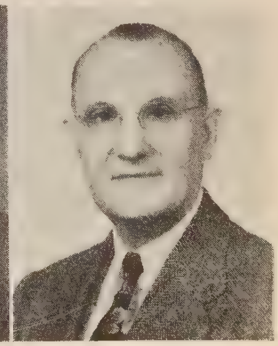


W. H. Klein

H. H. Lester



Stanton Walker



W. H. Whitcomb

Stanton Walker:

To Stanton Walker, Director of Engineering and Research, National Sand and Gravel Association, also Director of Engineering and Research, National Ready Mixed Concrete Association, Washington, D. C.—eminent in the field of concrete and concrete aggregates, where the results of much of the research he has stimulated for more than 30 years have effectively aided in ASTM Committee work, particularly in Committee C-9 on Concrete and Concrete Aggregates, of which he has been Secretary for 15 years. His work throughout has been characterized by recognition of the practical elements so fundamental to the effectiveness of specifications and methods of testing.

William Henry Whitcomb:

To William Henry Whitcomb, Cranston, R. I., for long and productive association with the work of Committee D-13 on Textile Materials, of which he was Chairman for two years and has been Secretary since 1930. His efficient handling of this committee's work, the editing of its standards, and stimulation of activities in the committee have brought to the committee and the Society an outstanding reputation for technical achievement in the textile world.

Notes on Annual Meeting Sessions

(Continued from page 11)

ments for the Administrative Committee on Research.

The first paper in this session, "Fatigue Strength of Ball Bearing Races and Heat-Treated 52100 Steel Specimens," was presented by Haakon Styri. Numerous fatigue tests on ball bearings have shown that the lives of individual bearings before failure by spalling or flaking, show a scatter over a wide range of 1 to 50 or more. In order to study the relation of load to life, as well as the effect of heat treatment on simple specimens, tests were run on ring-type, rotating-beam-type, Krouse-type, and torsion-type specimens. It is known that even quite small inclusions may be starting points for cracks, and a vacuum-melted steel was obtained in order to study the effect of reducing slag inclusions to a minimum. Even with this steel, the rotating-beam specimen gave wide scatter in life. It was concluded that the fatigue failures in bearings start at local weakness points in a region under the rolling contact path, where shear stresses are high.

M. R. Gross, in his paper, "Laboratory Evaluation of Materials for Marine Propulsion Gears," determined by means of contact roller test machines, pitting limits for six steels and eight non-ferrous materials as well as breakdown limits for five plastic base materials. The effect of hardening treatments, root radii, and surface finish and treatments on the endurance limit of the root area determined for three steels and the relative ratings for these materials were presented.

"The Influence of Surface Roughness on the Fatigue Life and Scatter of Test Results of Two Steels" was presented by E. F. Lundeen in the absence of the author, P. G. Fluck. The data showed as much as a tenfold increase in fatigue life due to polishing of the lathe-formed specimens. Specimens produced by a special method of gentle grinding gave high and uniform results even though rather large longitudinal scratches remained on the specimens.

G. Sines presented the paper prepared with D. Rosenthal on "Effect of Residual Stress on the Fatigue Strength of Notched Specimens." In this work an attempt was made to set up quantitative relations to predict the effect of residual stress on the fatigue resistance of metal parts. Tests were performed on notched 61S aluminum alloy. Residual stress, both compressive and tensile, had been set up at the base of the notch by a process of overstressing which created only negligible cold working. The X-ray stress technique was used to follow up the change of residual stress during testing. A quantitative prediction of these results was made by combining X-ray data with a modified Goodman diagram of the unnotched material.

B. J. Lazan presented a paper prepared by L. J. Demer and himself on "Damping, Elasticity, and Fatigue Properties of Temperature-Resistant Materials." The damping, elasticity, and fatigue properties of several temperature-resistant materials were investigated in rotating cantilever-beam testing equipment. Usual *S-N* fatigue curves were presented in addition to a series of new diagrams designed to show the effects of both stress magnitude and stress history on the damping and elasticity properties. Diagrams were also presented to facilitate comparison of the elasticity properties among materials tested at a given temperature.

The paper by B. J. Lazan and T. Wu on "Damping, Fatigue, and Dynamic Stress-Strain Properties of Mild Steel" was presented by title only. This paper analyzes stress magnitude and stress history data in terms of cyclic stress sensitivity limit and stabilized damping points. These data are presented in *S-N-N- S-N-D*, and other types of diagrams to indicate not only the fatigue behavior, but also the damping and dynamic modulus properties. Frequency sensitivity data are also presented in terms of strain rate and flow stress.

Symposium on Flame Photometry

The analytical chemist is constantly seeking methods that will permit more rapid determinations while maintaining the required accuracy. Conventional "wet" chemical methods involving chemical separations and volumetric or gravimetric determinations have, in general, provided the required accuracy but have sometimes required an excessive over-all time or too much time per determination. Where results are required very promptly or a large number of samples must be run, more rapid methods are imperative. In the analysis of metals, emission spectrochemical analysis has often proved to be the answer, while in other cases colorimetric measurements by means of photoelectric photometers have provided the desired combination of speed and accuracy.

Among the elements that have presented particular obstacles to the development of rapid, accurate methods, especially where the determination of small amounts were required, are the alkali metals such as sodium, potassium, lithium, calcium, and magnesium. Chemical separation and gravimetric determination have involved long, tedious procedures. Photometric measurement is not feasible because suitable color development in the solution is not possible. In the case of biologic samples, minerals, and residues, the need for putting the sample into solution has lost much of the advantage of emission spectrochemical analysis.

In relatively recent years, attention has turned to flame photometry which was found to provide a very satisfactory means of exciting certain elements, especially the alkali metals, in a solution of the sample and of making rapid measurements of their concentrations. The need for more rapid determination of sodium and potassium in cement has long been a major problem in the cement industry, and a careful study of the possibilities of flame photometry resulted in the preparation by ASTM Committee C-1 of the Test for Sodium Oxide and Potassium Oxide in Portland Cement by Flame Photometry (C 228 – 49 T).

The members of ASTM Committee D-2 have also been aware of the usefulness of flame photometry in the analysis of petroleum products, not only for the

alkalies but for other determinations such as that of tetraethyllead. Accordingly, Committee D-2 joined with Committee C-1 in sponsoring this symposium on flame photometry to provide a means of making generally available current information on the subject. Since Committee D-19 is now studying the application of the flame photometer to the analysis of water and water-formed deposits, with a method for sodium and potassium nearly ready for submittal to the Society, members of this committee also contributed a paper.

A total of eleven papers covered the history of the development of flame photometry and the apparatus and techniques that are currently employed or in process of being perfected.

The opening paper by Meloche presented a general review of the development of flame photometry.

Fox and Freeman described a stable internal standard flame photometer for alkalies in biological fluids that greatly reduces trouble from common sources of error such as changes in air and gas pressures and varying rates of flow of sample.

The application of flame photometry to the determination of alkalies in portland cement was covered by Diamond and Bean. Gilliland discussed the analysis of silicates and similar materials in addition to analysis for alkalies in cement. Lithium oxide was the specific alkali whose determination in cement was covered by McCoy and Christiansen.

The control of interferences caused by acids and salts in the determination of sodium and potassium was discussed in the paper by Eggertsen, Wyld, and Lykken. The effect of organic solvents was covered by Curtis, Knauer, and Hunter.

Applications of flame photometry to specific determinations were covered by Gilbert in his paper on tetraethyllead in gasoline and by Moberg, Waithman, Ellis, and Debois in their paper on calcium in lubricating oils.

King and Priestley described a modified recording flame photometer which was said to possess the advantages of eliminating need for internal standards and making possible a rapid qualitative analysis through scanning the flame spectrum of a sample, while being capable of high precision and accuracy on determinations of specific elements.

Scott, Marcy, and Hronas covered the application of flame photometry to the analysis of water and water-formed deposits, with especial consideration of analysis for sodium and potassium.

Extremely active discussion attested to intense interest in the subject of the symposium, which was attended by about 200 at each session. It is expected that the published symposium will be available later this year.

Methods of Testing

COMMITTEE E-1 on Methods of Testing presented a very comprehensive and interesting report on the principles involved in the determination of absolute viscosity. This extensive report (34 pages) presents in simplified form a discussion of the various principles by which viscosity may be determined in absolute units as contrasted to the arbitrary or empirical methods. It also describes in detail 23 viscometers that illustrate these principles. This information was compiled by the committee in an endeavor to encourage the recognition and practice of the use of viscometers yielding results in standardized units for true physical dimensions that will convey some meaning in all laboratories.

In addition to the Report of Committee E-1 there were presented at this session four papers describing investigations of new and improved testing techniques. Testing machines used for inspection of materials must be checked periodically by calibration devices. The paper by W. C. Aber and F. M. Howell on "The Constancy of Calibration of Elastic Calibrating Devices" described the elastic load calibrating devices used throughout the Aluminum Company of America. It also presented results of calibrations of these devices made by the National Bureau of Standards. The calibrations were carried out in substantial accordance with ASTM Tentative Methods of Verification of Testing Machines (E 4 – 50 T) using elastic calibrating devices and dead weights. The results reported showed the importance of using dial indicators that will repeat readings within narrow limits.

There has long been a need for information on the torsional properties of stainless steel used in structural members of aircraft and railroad cars. There has also been some uncertainty as to the constancy of Poisson's ratio with increasing stress when the stress-strain relationship is nonlinear and the material is anisotropic. The need for information on these properties has been accentuated by recent developments in the use of jet airplanes and guided missiles. The paper on "Mechanical Properties in Torsion and Poisson's Ratio for Certain Stainless Steel Alloys," by C. W. Muhlenbruch, V. N. Krivobok, and C. R. Mayne presented information of a fundamental nature for these properties of stainless steel structural alloys.

An impact test for cast iron which has been used for several years was described in the paper on "An Arbitration Bar Izod Impact Test for Cast Iron" by J. T. Eash and A. P. Gagnebin. The procedure consists of breaking a section of an unmachined arbitration bar in a modified Izod impact testing machine. The test results demonstrate the usefulness of the method both to develop the optimum composition and melting technique for new alloys and to assist in the selection of the material most suitable for particular engineering applications.

A new fatigue testing machine was illustrated by moving pictures and described in the paper on "Electrically Excited Resonance-Type Fatigue Testing Equipment" by T. J. Dolan, University of Illinois. The machine described is operated and controlled by simple electrical circuits and the majority of the electrical components are standard commercially available equipment. The loads are applied by inertia forces from two heavy masses between which is placed the 1-in. diameter test specimen. The system operates as a "tuning fork" which subjects the test specimen to vibratory bending stresses; it is automatically excited electronically in resonance with the natural frequency of the assembly (usually 40 to 100 cps). Several unique design features have been developed and incorporated into the control and shut-off mechanisms on the machine that are also applicable to exciting and controlling vibrations in other types of simulated service testing. Advantages and adaptability of the equipment for other uses were discussed by the author.

Plastics

IN ADDITION to the report of Committee D-20 on Plastics, which submitted a number of new and revised standards as covered later under Committee Notes, there were three interesting papers presented at this session.

The first paper, "Properties of Exposed and Unexposed Polyvinyl Butyral Coated Fabrics" by M. I. Landsberg, T. J. DiFilippo, and L. Boor, of the Philadelphia Quartermaster Depot, discussed tests made to obtain suitable lightweight rainwear which would have desirable tear, flexibility, low-temperature and degradation resistance characteristics. The tests were made on a series of coated Nylon fabrics in which the coatings were varied in a systematic manner and consisted of polyvinyl butyral plasticized with varying amounts of plasticizer. The results indicated that the most important variable was the modulus of the coating compound in its final cured form. Data were presented to show the effect of Florida exposure on such properties as tearing strength and flexibility. These indicated that approximately 360 hr expo-

sure to ultraviolet light are required to degrade seriously these materials. The ultimate loss of the total plasticizer was in the order of 60 per cent after 1440 sun hours of exposure.

The paper on "Creep Test Methods for Determining Cracking Sensitivity of Polyethylene Polymers" by W. C. Ellis and J. D. Cummings, Bell Telephone Laboratories, discussed conventional creep testing methods for evaluating cracking sensitivity of these plastics. The test results showed that crack resistance increased with plasticity number and, therefore, with increase in average molecular weight range.

Results of studies of "Creep Relaxation Relations for Polystyrene and Acrylic Plastics" made at Pennsylvania State College were presented in a paper by Joseph Marin and Yoh-Han Pao. Two methods of interpretation of constant stress creep test data were presented, namely, the short-time relation and the long-time relation. The authors reported that "a strain-hardening method for predicting the relaxation curves agreed well with the actual relaxation curves for both short and long periods of time."

Non-Ferrous Metals

THE Fifth Session, on Non-Ferrous Metals, was held on Tuesday morning, June 19. In addition to the annual reports of Committees B-1, B-5, B-8, and B-9, four papers were presented.

The first of these papers was presented by A. I. Blank, coauthored with H. T. Burghoff, entitled, "The Creep Characteristics of Phosphorized Copper (0.019 per cent) at 300, 400, and 500 F." Blank pointed out that the creep strength of annealed copper increased with grain size at these temperatures. The relative lowering of creep strength produced by increasing temperature diminished as grain size increased. The creep strength of the drawn material at 300 F increased with degree of cold working but decreased at 400 and 500 F as softening became a factor.

A paper by W. H. Munse and N. A. Weil (presented by Munse) on "Mechanical Properties of Copper at Various Temperatures" presented the results of coupon tests conducted on electrolytic tough-pitch copper, deoxidized high-phosphorus copper, and oxygen-free high-conductivity copper, at temperatures ranging from −321 F to +400 F. These three materials were tested in two thicknesses and at two temperatures.

W. M. Baldwin, Jr., presented a paper prepared by E. J. Ripling and himself on "Rheotropic Brittleness: General Behaviors." The authors found that the brittle behavior of a metal with a hexagonal type crystal structure (pure zinc) at temperatures less than the transition value was largely strain curable (rheotropic). They suggested that rheotropism is a general property of materials that show a transition temperature and that it is not confined to the brittleness induced by low temperatures. Since the brittleness of notched steels was found to be rheotropic, they assumed that the brittleness induced by any of the three known embrittling variables (temperature, strain rate, stress state) is strain sensitive.

W. M. Baldwin, Jr., presented a second paper, prepared in collaboration with C. A. Phalnikar, on "The Scaling of Zirconium in Air." Their studies were made in the temperature range of 400 to 1300 C and in the time range of 6 min to 575 hr. They found that zirconium forms a double-layered scale: an outer white or buff scale (monoclinic ZrO_2) that predominates at temperatures below 1050 C and an inner black scale (monoclinic and tetragonal ZrO_2, cubic ZrN, and possibly nitrogen) that occupies the greater thickness at temperatures above 1050 C. It was reported also that zirconium strip undergoes extraordinary dimensional changes during scaling, with the dimensions in the rolling plane treble the original sample area in some cases.

Symposium on Structural Sandwich Construction

THIS Symposium sponsored by Committee C-19 provided an interesting group of papers, the first presented before the Society dealing with this revolutionary new type of construction combining similar and dissimilar materials into structural assemblies. The magnitude of the many types of basic materials and combinations thereof, which have been used in sandwich construction, was brought out in a paper by Bruce G. Heebink, Forest Products Laboratory, who discussed fabrication techniques. The variety of applications and techniques has made it desirable to classify the various sandwich type materials as to functions, physical shape, and processing techniques. Several papers in the symposium were from the Forest Products Laboratory. The opening paper by President L. J. Markwardt was a comprehensive treatise of lightweight composite construction, in which Mr. Markwardt outlined the developments and trends in a very clear and interesting manner. Strength properties of sandwich construction were covered by Charles B. Norris, Forest Products Laboratory, who described a number of modes of failure that are peculiar to sandwich construction. The paper by H. W. March, also of FPL, surveyed a selected group of problems concerned with the elastic behavior of sandwich construction. Formulas were outlined for measuring the stability of facings, the lack of which in a sandwich construction under compressive stress causes wrinkling or buckling of a panel. Stability of a flat rectangular sandwich panel under compressive end loads and in shear was also discussed.

The compressive and torsional instability of sandwich cylinders was discussed by George Gerard, New York University. Equations were presented on the general buckling theory of curved sandwich elements and on the over-all buckling under axial compression and under torsional loads. The solution for wrinkling for flat sandwich plates and for sandwich cylinders under axial compression was shown from further equations described. A paper summarizing work on a particular type of sandwich construction material, namely, paper cores for use in aircraft and for house construction, was presented by E. W. Kuenzi, Forest Products Laboratory. Various tests were described which have furnished information regarding properties of the paper honeycomb cores and also of some sandwich construction using these cores. These properties included strength, thermal insulation, and fire tests. The paper concluded with a description of an experimental unit constructed of sandwich wall, floor, and roof panels in 1947, sections of which have since been replaced in order to test various other types of materials. Observations, including measurements of temperature, humidity, and panel bowing have been taken periodically, and from the data and appearance of the structure, it is concluded that it is possible to construct a durable, satisfactory house by using paper honeycomb core materials in wall, floor, and roof panels. Aluminum honeycomb sandwich construction was described by T. P. Pajak, The Glenn L. Martin Co. This type of material has been used with a great deal of success in the manufacture of various parts of aircraft, such as flooring panels, doors, cabin partitions and structural components of wing surfaces. Recent trends indicate that the rapidly increasing percentage of new airframe and missile designs are utilizing aluminum honeycomb sandwich construction.

A paper dealing entirely with sandwich construction as used in buildings was presented by G. M. Rapp, John B. Pierce Foundation, and is entitled "Some Developments in Structural Sandwich Building Panels Having Inorganic Cores." Several technical chara

ristics which distinguish sandwich onstructions for building use from hose designed for applications in the rcraft and transport industries were pinted out, as well as the necessity for onsidering economical types of ma-rials. The results of tests show that ndwich compositions using certain re materials, faced with either thin ywood, asbestos-cement board, or eel-surfaced hardboard, have a static d impact flexural strength and iffness adequate for many building plications.

Symposium on Surface and Subsurface Reconnaissance

A DEPARTURE from the usual presentation of a series of papers was made in the sessions of the Symposium on Surface and Subsurface Reconnaissance. This symposium was sponsored by Committee D-18 on Soils for Engineering Purposes and represented the activities of its Subcommittee R-1, under the chairmanship of L. E. Gregg, Kentucky State Highway Department. A group of fourteen papers are included in the symposium, but these were presented only in a brief descriptive form as part of the two sessions. The bulk of the time was used to conduct a panel discussion with the authors being the members of the panel. This type of presentation, with questions and discussion, was well received and proved to be of direct benefit in having phases of the subject discussed.

The first of the two sessions discussed the aspects of pedology, geology, and air photo applications. The group of papers included in the second session applied generally to the geophysical factors and included discussions on resistivity test methods and the application of seismic methods.

COMMITTEE NOTES

The following notes are intended to give some idea of the major accomplishments and activities of the various technical committees as reported at the Annual Meeting.

The notes are in order of the serial designation of the committees, "A" group first, "B," etc. Some of the "E" work is of direct interest to the other groups.

"A" Group

Committee A-1 on Steel

IN ITS preprinted report, ommittee A-1 had recommended Prosed Tentative Specifications for Carbon eel Sheets of Flange and Firebox Quali-es. However, the sampling procedure r mechanical testing included in the ecifications is not too workable for sheet aterial in coils, and the committee has mporarily withdrawn the recommenda-on.

A general manual on the mechanical sting of steel is being prepared. At esent Committee A-1 has two mechani-l testing procedures assigned ASTM signations, one covering steel spring ire and the other covering steel bars. lso approved for publication but not ven designations are procedures for ructural steel products and for steel bular products. It is intended to in-ude in the manual the four classes of oducts mentioned. From time to time, procedures for other classes of products e written, the manual is expected to be vised and reissued.

The General Requirements Specifica-on for Structural Steel (A 6) is being vised in two respects. The A.R.E.A. s requested a limitation on the size of ates to be bundled to gages up to $\frac{5}{16}$ in., clusive, and to widths of 36 in. and der. The table covering permissible riation from flatness for rectangular eared mill, universal mill, circular and etch plates is being revised.

Revisions in Specifications A 273 and 274 covering carbon and alloy steel ooms, billets, and slabs for forgings, pectively, are nearing final form. A ecification covering seamless vessels compressed gas is being prepared and ould be ready for subcommittee ap-aisal shortly.

An illustrative chart of the types of imperfections and defects found by macroetching steel forgings is being balloted on in the Forgings Subcommittee. This chart, under development for some time with much effort involved if adopted, will accompany Tentative Methods A 317 of Macroetch Testing and Inspection of Steel Forgings.

The manufacturers of acid steel railroad tires have requested relief on the maximum limitations on phosphorus and sulfur because of the critical scrap situation. Actions contemplated as emergency alternate requirements are an increase of the maximum phosphorus and sulfur in Specifications A 26 for Steel Tires and A 329 for Heat-Treated Steel Tires from 0.05 to 0.06 per cent. These emergency requirements will apply only to acid steel. It is also planned as an emergency requirement to change the manganese range of Specification A 329 from "0.60 to 0.90" to "0.50 to 0.90." This will permit the heat treatment of tires where small orders are involved and it is necessary to use a portion of the heat manufactured for untreated tires. The latter action will apply to both acid and basic steel.

In the castings field, a subcommittee letter ballot on proposed tentative specifications for heavy walled carbon and low alloy steel castings for turbines is being conducted. Also a proposed standard test coupon for steel castings resulting from considerable investigation by the producers of steel castings under the auspices of the Steel Founders' Society has been submitted to the castings subcommittee. This proposed test coupon design is being referred to a task group charged with drafting a mechanical testing procedure for steel castings.

In Specifications A 213 and A 249 covering alloy steel boiler and super heater tubes, it is proposed to include heat exchanger and condenser tubes. Specifications A 134 and A 139 covering electric-fusion welded steel pipe are undergoing extensive revision.

Two new specifications for steel plates for boilers and other pressure vessels are being completed by the Boiler Plate Subcommittee. These include an $8\frac{1}{2}$ per cent nickel steel and a 4 to 8 per cent chromium steel. Specification A 300 for steel plates for pressure vessels for service at low temperatures is undergoing revision to bring the impact requirements more in line with other specifications. Also grade E of Specification A 203 covering nickel-steel plate is being added to Specification A 300. The flatness tables in General Requirements Specification A 20 will probably be revised.

The Subcommittee on Steel Bars will write new specifications for cold-drawn, heat-treated, machine-straightened and stress-relieved, alloy steel bars. A proposed specification for nitriding steel bars on which the subcommittee has been doing intensive work is in its final stages and it is expected that the Society will be asked soon to publish this specification.

In the field of high-temperature and subatmospheric temperature applications, it is proposed that the phosphorus content for the ferritic alloy steel pipe specifications be revised to require 0.040% phosphorus on ladle analysis and 0.045 per cent on check analysis as an emergency alternate provision. For some time a group appointed by Committee A-10 has been working on a specification for centrifugally cast steel pipe. It has been recommended that some representatives of Committee A-1 be named to this group and that it be established as a joint A-1-A-10 project.

Specifications for forgings for low temperature service and for castings for low temperature service are in their final stages.

A revision of Specifications A 325 covering quenched and tempered steel bolts and

studs with suitable nuts and plain washers has been approved by committee action and the Society will be asked to publish this revision very soon. The new revision includes the wedge test wherein a ten-degree wedge is placed under the head of the bolt. A new specification for quenched-and-tempered alloy-steel bolts and studs with suitable nuts is being worked upon by the committee on bolting, because of the current shortage of alloying elements and the fact that there is only one specification (A 193) for alloy-steel bolting material. The new specification will be designed for normal temperature applications.

Committee A-2 on Wrought Iron

After a period of inactivity for a number of years Committee A-2 is being reorganized under the chairmanship of A. D. Morris, Bayonne Bolt Corp., with D. M. Stembel, Lockhart Iron Corp., *Vice-Chairman*, and L. S. Crane, Southern Railway Co., *Secretary*. At a very interesting meeting on June 19, several actions were recommended for letter ballot including the cancellation of specifications A 85 for common iron bars and the reaffirmation of specifications A 41 for refined iron bars. In specifications A 84 for solid staybolt wrought iron and A 86 for hollow-rolled staybolt wrought iron an editorial rewording of the cold bend test for clarification purposes was proposed. Also it was recommended in specifications A 83 for lap-welded and seamless steel and lap-welded iron boiler tubes that all reference to iron boiler tubes be deleted and that the committee release its joint jurisdiction with Committee A-1 over these specifications.

Other specifications including A 42 for wrought iron plates, A 72 for welded wrought-iron pipe, and A 152 for wrought iron rivets and rivet rounds were referred to subcommittees for review.

Among those attending this reorganization meeting was James Aston, member of Committee A-2 since 1917 and vice-chairman from 1926 to 1943.

Committee A-5 on Corrosion of Iron and Steel

Having submitted the new Tentative Specification for Zinc-Coated Iron or Steel Chain-Link Fence Fabric Galvanized Before Weaving (A 337 – 51 T), Committee A-5 is now considering a similar specification for chain-link fence galvanized *after* weaving. Revisions in Tentative Methods of Test for Local Thickness of Electrodeposited Coatings (A 219 – 45 T) were recommended by both Committee A-5 and B-8.

Work is continuing on the revision of Standard Specifications for Zinc (Hot-Galvanized) Coatings on Structural Steel Shapes, Plates and Bars and Their Products (A 123 – 47) and Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware (A 153 – 49) to clarify the use of these two specifications in so far as small structural shapes are concerned. Further study is being made toward the formulation of a simple embrittlement or malleability test applicable to hardware.

The atmospheric exposure site on Brunot Island, Pittsburgh, has been discontinued at the request of the owner. All sheet tests at this location were discontinued but a number of wire specimens were transferred to the roof of the Bureau of Mines in Pittsburgh. The committee, at the request of the owner, has also been asked to reduce the size of its site in Bridgeport, Conn.

There has been considerable discussion of the hardware tests and current consideration is being given to the development of a new series of tests.

Committee A-7 on Malleable-Iron Castings

As a result of further study of the Tentative Specifications for Malleable Iron Flanges, Pipe Fittings and Valve Parts (A 277 – 44 T), it has been decided to substitute for that specification a new tentative with the title "Malleable Iron Flanges, Pipe Fittings and Valve Parts for Railroad, Marine and Other Heavy Duty Service," with the understanding that this specification will be issued under a new designation and A 277 will be withdrawn. The proposed new tentative, under the jurisdiction of the newly organized Subcommittee V of Committee A-7, has been approved by unanimous letter ballot, and is being referred to ASTM for publication.

Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys

Reverting back to World War II days, the committee has submitted the following Emergency Alternate Provision to the Administrative Committee on Standards for approval:

> In view of the limited availability of columbium (with the heretofore usual small percentage of tantalum) the stabilizing addition to type—shall consist of columbium plus tantalum. The ratio of columbium to tantalum (in relation to the carbon content of the steel) and the maximum of each element, or of one of them, or of the two combined, shall be determined in accordance with the requirements of the end use and shall be as mutually agreed upon by producer and purchaser.

This provision will affect standard specifications A 167, A 240, A 269, and A 271 and tentative specifications A 276, A 296, A 312, and A 314.

Revisions of the Recommended Practice for Boiling Nitric Acid Test (A 262 – 50 T) have been submitted to the committee for approval. As a result of an investigation of alternate specimen shapes for tension testing of stainless steel plates Specifications A 167, A 176, and A 240, are to be revised.

During the past year Subcommittee VI on Metallography has been correlating considerable data obtained on 18–8 steels (with and without molybdenum) in an effort to identify the sigma phase after heating to elevated temperatures. Various etching procedures for identification of the sigma phase have been studied and progress has been made.

A specification for stainless steel strand wire is under consideration as is a specifi[...] tion for a centrifugally cast tubing [...] heat- and corrosion-resisting service.

Further consideration of revisions [...] A 312 (austenitic pipe) includes a n[...] schedule of wall thickness known [...] schedule 5 S and a heat-treatment clau[...] The committee has also been asked [...] consider a specification for stainless st[...] pipe made by fusion welding process[...] up to 24-in. size.

"B" Group

Committee B-1 on Wires for Electri[...] Conductors

After completion of the [...] vision of Specifications B 1 for hard-dra[...] copper wire to include sampling pro[...] dures based on statistical methods, simi[...] work is now under way on Specificati[...] B 3 for soft or annealed copper wire.

A task group in Committee B-1 [...] nearly completed its work on the devel[...] ment of a gage for inspection testing [...] grooved trolley wire. The task group [...] revision of significant figures in all tab[...] of wire sizes has been collaborating w[...] the National Bureau of Standards [...] establish bases of calculation to be u[...] in the forthcoming revision of *Circular* [...] 31. Agreement has been reached on ba[...] wire sizes, and methods of computation [...] certain derived data.

Another task group is working on [...] preparation of proposed specificati[...] covering the American Wire Gage. T[...] work is well advanced, and it is hoped [...] proposal can be approved in the n[...] future.

Other task groups are considering st[...] ness test requirements for magnet w[...] the optimum percentage of tin in lead-al[...] coatings, and possibly reduced ten[...] strength requirements for wire in coil[...] smaller than normal diameter.

Upon the recommendation of Comm[...] tee B-1 a convenient new compilation [...] been published by the Society in 1[...] under the title "ASTM Standards [...] Metallic Electrical Conductors."

During the year organization of a r[...] ASA Sectional Committee C7 on B[...] Electrical Conductors was comple[...] under ASTM sponsorship and action [...] been instituted to have a number of AS[...] specifications approved as Ameri[...] Standards. Committee B-1 has had [...] active part in this endeavor.

Committee B-2 on Non-Ferrous Metals [...] Alloys

Work during the past y[...] has been confined primarily to devel[...] ment of specifications for two materi[...] one a material long known and widely u[...] in the metal industry—tin; the ot[...] metal, titanium, a relative newcomer [...] the field of engineering materials. [...] both cases specifications are in a d[...] form. Tentatively, five grades of tin [...] be covered in the tin specifications and [...] various metal forms of titanium with [...] exception of "sponge" will be included [...] the specifications for titanium.

Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys

CONTINUING its important work on total immersion tests. Committee B-3 is initiating a study of three metals in fully aerated solutions of sulfuric acid, sodium hydroxide, and sodium chloride. In addition to the total immersion studies, test panels are currently being prepared for further investigation of the acetic acid-salt spray test.

The remaining non-ferrous exposure specimens which have been on test since 1931 will be called in and the physical tests made thereon. It was agreed that little additional information would result from another 5 yr of exposure and therefore the tests are being terminated at the end of 20 yr rather than at 25 yr as originally planned.

Considerable discussion at the Atlantic City meeting revolved around the desirability of having complete knowledge of the nature of the corrosion products on the 20-yr specimens which are to be called in. A study comprehensive enough to give the valuable data desired would require at least $50,000. Further study of this possible work will be made before the test specimens are removed from the racks.

Subcommittee VII is continuing its work on calibration of various atmospheres by means of ascertaining weight loss of zinc and steel specimens.

Another action taken at the Annual Meeting was the unanimous election of H. S. Rawdon, as Honorary Chairman of Committee B-3. Dr. Rawdon, a long-time member of the committee, and chairman, 1944–1948, had a long record of constructive service in this group.

Committee B-4 on Electrical Heating, Resistance, and Related Alloys

Two actions approved by subcommittees and currently out to ballot in the committee involve revisions in the temperature section of the Method of Accelerated Life Test for Metallic Material for Electrical Heating (B 76 – 39) and modifications of thickness-width ratios as specified in the Standard Method of Testing Thermostat Metals (B 106 – 40).

Subcommittee X on Contact Materials has completed a method of determining hardness of contacts and referred this to Committee E-1 for comment. In 1943 this subcommittee compiled a "Bibliography on Electrical Contacts." Periodically thereafter paper-bound supplements were issued. As a result of continuing interest in the original book and decreasing interest in each succeeding supplement (there now being six supplements), the subcommittee has decided to concentrate on a revised edition of the book to include all supplementary references up to and including 1950. This publication should be available early in the fall.

Several methods for small sample, chemical analysis of cathode "impurities" have been approved in cooperation with Committee E-3 and, when others are completed, a broad specification of cathode impurities will be set forth.

Committee B-4 has also cooperated with the Joint Electron Tube Engineering Council (JETEC) in preparing a summary of cathode materials and sizes in connection with programs concerning strategic materials.

Specifications for a 17 per cent chromium-iron alloy and another for a 28 per cent chromium-iron alloy (for metal-to-glass seals) have been submitted to the ASTM Administrative Committee on Standards, for approval. A revision of the Measurement of Mica Stampings Used in Electronic Devices and Incandescent Lamps (D 652 – 43) was prepared and sent to Committee D-9 on Electrical Insulating Materials under whose jurisdiction Methods D 652 fall.

During the year, the committee, in the death of F. E. Bash, lost one of its very active members. Mr. Bash was the secretary of Committee B-4 for over 25 years. The new secretary is Stanton Umbreit, R.C.A., Harrison, N. J.

Committee B-5 on Copper and Copper Alloys

DURING the past year Committee B-5 has centered practically all its efforts in a rearrangement of its specifications covering wrought products. In this rearrangement, a general requirement specification covers a field of products such as plate, sheet and strip including all the tolerance tables applicable to these products as well as other requirements which formerly appeared in each individual product specification. Each individual product specification now includes only those quality requirements peculiar to the specification, and reference is made to the applicable general requirement specification for general requirements.

There are four general requirement specifications covering (1) plate, sheet, and strip; (2) tubular products; (3) rods, bars, and shapes; and (4) wire.

Under consideration in the castings field, is the preparation of a document similar to British Standard 1367:1947 "Code of Procedure in Inspection of Copper-Base Alloy Sand Castings," and also the preparation of specifications for centrifugal castings.

Committee B-6 on Die-Cast Metals and Alloys

COMMITTEE B-6 as a part of its work on die-casting has reported the completion of the design of a test casting-die for hot or cold chamber casting of zinc alloys. As a result of discussions held in 1946 and 1947 a new Subcommittee IX on Die Casting Processes was specifically charged with investigation of certain factors pertinent to the die-casting process including pressure, temperature, plunger speed, melting practices, die gating and venting, and die lubrication. This investigation, the details of the work and the conclusions drawn from the data obtained are covered in an important paper on "Aluminum Die Castings—The Effect of Process Variables on Their Properties," by W. Babington and D. H. Kleppinger, which is appended to the 1951 report of Committee B-6.

Further activity includes formation of a new task group to set limits for impurities generally found in die castings but not at present covered in the Standard Specifications for Zinc-Base Alloy Die Castings (B 86–48). Committee B-26 is also considering adoption of the so-called Frankford Arsenal system of light alloy codification.

Committee B-7 on Light Metals and Alloys, Cast and Wrought

SUBSEQUENT to the 1950 Annual Meeting, Committee B-7 submitted through the Administrative Committee on Standards revisions of the following tentative aluminum specifications: B 26 – 50 T (sand castings), B 108 – 50 T (permanent mold castings), B 178 – 50 T (sheet and plate for pressure vessels) and B 179 – 50 T (ingot form). These appear in the 1950 Supplement to Book of ASTM Standards, Part 2. The committee has recommended to the society further revisions of B 178 and a revision of B 209 – 50 T (sheet and plate, aluminum and aluminum-alloy) changing the lot sizes for tension tests. The committee is currently preparing a recommended practice for codification of light metals and alloys.

The collection of samples for the corrosion program has been completed and the fabrication of the test specimens will be finished in the near future so it is expected the specimens will be put on exposure before the end of the year.

Committee B-8 on Electrodeposited Metallic Coatings

COMMITTEE B-8 did not find it necessary to meet during the Annual Meeting, but its accomplishments during the past year are worthy of note. Three important new Recommended Practices were submitted to the Society:

1. Preparation of Zinc-Base Die Castings for Electroplating (B 252 – 51 T).
2. Preparation of and Plating on Aluminum Alloys (B 253 – 51 T).
3. Preparation of and Plating on Stainless Steel (B 254 – 51 T).

In addition to these new tentatives, revisions as detailed in the 1951 Report were recommended in the specifications for zinc on steel (A 164 – 49 T) and cadmium on steel (A 165 – 49 T) to include references to threaded fasteners. The Method of Test for Local Thicknesses of Electrodeposited Coatings (A 219 – 45 T) was revised considerably.

Two tentatives were recommended for adoption as standard without revision, the Specifications for Electrodeposited Coatings of Nickel and Chromium on Zinc and Zinc-Base Alloys (B 142 – 45 T), and Recommended Practice for the Preparation of High-Carbon Steel for Electroplating (B 242 – 49 T).

Subcommittee II on Performance Tests has published another interim report (first report was in 1949) on the "Atmospheric Exposure of Copper-Nickel-Chromium Deposits on High-Carbon Steel." Several important conclusions,

based upon the considerable amount of data available to date and published in the report, are drawn:

1. The thickness of the nickel plate, either directly plated on steel or as an intermediate component of a composite copper-nickel-chromium coating, was the principal determining factor in the atmospheric weathering characteristics of such coatings on steel in the wide range of atmospheres represented in the tests.
2. The copper undercoatings (a cyanide copper strike or a cyanide copper strike plus acid copper) added little to the protective value of composite copper-nickel-chromium coating on steel, and what little they did add was important only in the early stages of deterioration or in the mildest corrosive atmospheres.
3. The type of nickel plate (dull, semibright, or bright) exerted no important influences on coating life, at least within the range of plate types included in the tests.
4. Identical coating systems, within the range of the simple and composite coatings studied, behaved similarly on a high-carbon steel base and on the low-alloy, high-yield-strength steel tested.

Committee B-9 on Metal Powders and Metal Powder Products

Committee B-9 has approved the two tension test bars described in the 1950 Report for incorporation in Methods of Tension Testing of Metallic Materials, E 8. These two bars include both the machined and unmachined specimens.

The Subcommittee on Metal Powders has drafted chemical analytical methods as follows, and will submit them to ASTM Committee E-3 for its consideration: Proposed tentative method of chemical analysis of metal powders, proposed tentative method for determination of hydrogen loss in metal powders, iron content of iron powders, and insoluble matter in iron and copper powders.

The subcommittee also will submit to Committee E-1 a proposed method for subsieve analysis of granular metal powders by air classification. A proposed method for the determination of compressibility of metal powders has been prepared, which will be evaluated in a number of the members' laboratories.

The Section on Bearings has drafted a table of recommended running clearances and press fits for metal powder sintered bearings, which however is undergoing modification. The section has accumulated the known size lists for sintered bearings and is endeavoring to arrive at a standard size list suitable for issuance by ASTM.

The Section on Structural Parts is preparing proposed specifications for sintered metal structural parts from brass. Also being considered are drafts of specifications for copper impregnated structural parts from iron and for porous filter materials made from metal powders.

In the Section on Cemented Carbides a method for porosity has been developed which has been checked by several laboratories with satisfactory results. A newly constituted group on hardness has started a program of cooperative tests looking toward the preparation of a proposed method for Rockwell hardness testing of cemented carbides. Also being prepared are proposed methods for transverse rupture testing and two proposed tentatives for specific gravity determination.

Joint Committee on Effect of Temperature

A news account of the activities of this joint ASTM–ASME Committee will appear in the September Bulletin.

"C" Group

Committee C-1 on Cement

In addition to the very well-attended main meeting of Committee C-1, the committee program centered around the technical session jointly sponsored by the committee with Committee D-2 on Petroleum Products and Lubricants, which presented a symposium on flame photometry.

A subject which provoked much discussion was the suggested use of the Wagner turbidimeter method as a referee test in the two ASTM specifications for portland cement, C 150 and C 175 T, when the Blaine air permeability test is used. In the field of masonry cement, it was reported that cooperative tests on masonry mortar are being continued, with special study being given to the mixing operation and a comparison between manual and mechanical methods.

A progress report was presented on cooperative tests of blended cement, which are to establish sufficient data to confirm limits which would be set up in proposed specifications for fly ash and for portland cement containing fly ash. Five laboratories are working on twenty samples of fly ash for this project. A quick chemical test for use in pozzolanic materials is receiving attention in a subcommittee.

The Committee will hold its Fall meeting at Purdue University on October 24–26, incl.

Committee C-2 on Magnesium Oxychloride and Oxysulfate Cements

The last of a series of test methods needed for specifications were considered at the meeting of Committee C-2 on Magnesium Oxychloride and Magnesium Oxysulfate Cements on June 21. This proposed test method is for the determination of shear strength of bonding media for magnesium oxychloride cements. However, its publication is being held in abeyance, pending further test data. Comments received with negative votes covering the acceptance of three proposed tentative specifications were considered and resolved in order that they may be recommended to the Society. These specifications cover oxychloride magnesium, magnesium chloride, and magnesium sulfate.

Committee C-3 on Chemical Resistant Mortars

The report of Committee C-3 on Chemical Resistant Mortars, one of the newest technical groups, indicated much progress during the year. In addition to the new tentative test for chemical resistance of hydraulic cement mortars other test methods are nearing completion including requirements for sulfur mortars. Resin-base mortars are being studied, and a group concerned with bond strength is perfecting a new test for that property.

At the Atlantic City meetings, Dr. A. C. Loewer presented a paper on "Physical Properties of Plasticized Cements" prepared by himself, Messrs. W. J. Eney, R. Seymour, and W. Pascoe.

Committee C-4 on Clay Pipe

An ASTM standard which has been published for thirty-two years without change has now been completely rewritten by Committee C-4 on Clay Pipe as reported at its meeting on June 19. The Recommended Practice for Laying Sewer Pipe (C 12 – 19) in revised form will be presented to the Administrative Committee on Standards as a tentative to replace the existing standard. It will cover clay pipe only. Research was reported on a revision of apparatus used in the three-edge-bearing test method for crushing strength in relation to the wooden bearing block, which is presently considered inadequate. A new specification was recommended for acceptance for extra-strength ceramic glazed pipe. However, before presenting this to the Society, it is expected that a study will be completed on the possibility of combining the several ASTM specifications on clay pipe into one or the separation of the test procedures in order to avoid repetition of contents.

The development of specifications for clay flue linings is proceeding slowly at the present time, due to the variable conditions found throughout the country with respect to code requirements and the use of modular and nonmodular size units. Further study will be made in this connection.

Committee C-7 on Lime

A specification for chemical lime for leather treating was considered at the meeting of Committee C-7 on Lime. This represents an additional field where lime is used for which ASTM specifications are desired, and will include both high-calcium and dolomitic lime. A revision of the specifications for Silica Brick Manufacture (C 49) will be sent to manufacturers of silica brick for comment. Revision of the existing Specification for Quicklime and Hydrated Lime for Water Treatment (C 53) was accepted for letter ballot of the committee, which will divide the specification into two parts, namely, Part A for water purification, using high-calcium lime with limits of 90 per cent available calcium oxide; and Part B for lime for

iscellaneous water applications, using her high-calcium or dolomitic lime with nits of 93 per cent total calcium oxide d magnesium oxide.

A need was expressed for a fast method r determining iron content in lime, using e present ASTM method for referee pur-ses. A new method for determining ailable lime, developed at Massachu-tts Institute of Technology, is of interest the committee and will be evaluated.

mmittee C-9 on Concrete and Concrete Aggregates

At THE meetings of Com-ittee C-9, Frank Jackson, a former chair-an of C-9 as well as of Committee C-1 on ment, was elected an honorary member the committee. It was announced that new subcommittee was authorized for e preparation of a manual on concrete sting.

A new chemical test method for deter-ining reactivity is completed and will balloted on. The descriptions of the nstituents of natural mineral aggre-tes, which appeared in the January, 51, ASTM BULLETIN, as information, as recommended as a new tentative with minor revision pertaining to a footnote ncerning blast-furnace slag and light-eight aggregate.

Two complete revisions of existing andards were accepted, subject to letter llot. The Standard Method of Test r Volume Change of Cement Mortar and oncrete (C 157) will be replaced by a new ntative of the same designation, giving uch more detail on the mixing of the mortar and the concrete, using both hand and machine mixing. Another new section describes in detail the curing of specimens. The Standard Specification for Concrete Aggregates (C 33) will be revised and reverted to tentative status. The principal changes include a deletion of reference to coal and lignite limitations as deleterious substances and setting up a limit of material coarser than No. 50 sieve which will float on liquids of a certain specific gravity, and a definite limitation on loss by abrasion of coarse aggregate as measured by use of a Los Angeles machine. A third draft of a revision of the Standard Specifications for Lightweight Aggregates for Concrete (C 130) is now ready for letter ballot of the subcommittee. The first draft of a specification and a method of test for fly ash is expected to be completed before the next meeting this Fall. Cooperative tests on abrasion test methods, including the cutting, rubbing, or sliding and the ball types, will be made as an activity of one of the three new subcommittees authorized during the past year. Exploratory tests using three methods will be run by the new subcommittee on setting time to establish data on desirable properties. The first draft of a procedure for conducting freezing and thawing tests has been prepared, based on the Tentative Specifications for Additions (C 226 T) and the Tentative Method of Testing Air-Entraining Admixtures for Concrete (C 233 T), using specimens frozen and thawed in water.

The committee will hold its Fall meeting jointly with Committee C-1 on Cement at Purdue University on October 22 to 24.

ome of the long-time and new officers of Committee C-9. (Photograph courtesy L. E. regg, Assistant Director of Research, Highway Materials Research Laboratory, Uni-rsity of Kentucky.) Front row, from l. to r.: Fred Hubbard, The Standard Slag Co., ng-time member of C-9 and currently Vice-Chairman; Kenneth B. Woods, Purdue niversity, Chairman of Committee C-9 since 1946; Stanton Walker, National Sand and ravel Assn., Secretary of the Committee 1926–1932 and again 1942–1950 and now hairman Group III (Specifications and Test Methods) Subcommittees. Back row, om l. to r.: A. T. Goldbeck, National Crushed Stone Assn., long-time member of the ommittee, Chairman 1922–1926 and Secretary 1918–1922, now relinquishing his chair-anship of the Group II (Research) Subcommittees; R. R. Litehiser, Ohio State Highway esting Lab., Chairman of Committee C-9 1932–1942, is relinquishing his chairmanship the Group III (Specifications and Test Methods) Subcommittees; Bryant Mather, oncrete Research Div., U. S. Waterways Experiment Station, new Secretary of Com-ittee C-9. Of this group, Messrs. Goldbeck and Walker received honors from the ociety at the Annual Meeting—Mr. Goldbeck being elected an ASTM Honorary Member d Mr. Walker, a new director of the Society, also received a 1951 Award of Merit.

List and Designations of New Tentatives

A complete list of the new tentative specifications and tests and some of the more extensively revised tentatives, including the complete serial designations, appears on page 32. Members may wish to refer to this list when they review the statements on some of the highlights of the technical committee activities. In this accompanying text material, no serial designations for the new tentatives are given, and in some cases the titles are shortened. Consult the list on page 32 for complete titles and serial designations of new tentatives.

Committee C-15 on Manufactured Masonry Units

A NEW tentative specification was recommended for letter ballot of Committee C-15, representing the first attempt to cover the field of chemical-resistant units. A subcommittee for this purpose has been working diligently for some time in preparing this first specification which includes test methods. An investigation will be sponsored on a comparison of the present ASTM method for capping concrete and mortar cylinders with the use of sulfur mixtures. It was suggested that additional materials other than sulfur be investigated, such as metal and cardboard, which are now being used as capping materials.

Committee C-20 on Acoustical Materials

DEFINITE progress was reported at the meeting of Committee C-20 toward the development of ASTM standards. Research on the basic property of sound absorption is organized into task groups, one of which is conducting cooperative tests in seven reverberation chambers, using three commercial samples of acoustical material to establish uniformity of results. The same commercial samples are being used in a round-robin series of tests to obtain data on the tube method with eighteen tubes being used. Data on the box method is also being collected from two sources where tests are being conducted.

The study of fire resistance is being handled through the current review of Federal specifications, with a proposed revision of the method being considered. The formulation of proposed methods for measuring other physical properties is in varying stages of development, with round-robin tests to be run on a flow resistance method, which will be correlated with sound absorption. A method for measuring light reflection, using the Baumgartner sphere, is being reviewed. A draft has been prepared for strength test methods, which will be used to obtain test data. Another activity of the committee deals with maintenance and application problems, but research is needed before standard methods can be considered.

"D" Group

Committee D-1 on Paint, Varnish, Lacquer, and Related Products

COMMITTEE D-1 continues its high rate of activity as evidenced by meetings of 88 subcommittees and sections in a three-day period.

The Committee sessions were highlighted by a paper on "Weathering of Paints" presented by R. J. Wirshing, General Motors Corp. Further reference to this paper is made elsewhere in this BULLETIN.

Cooperation with the Federation of Paint and Varnish Production clubs has resulted in approval by the Federation of 6 additional ASTM Methods (bringing the number of standards now approved to a total of 43). Through the Joint Federation-ASTM Committee, arrangements are now being made for review by the Federation Clubs of an additional group of 12 specifications and several methods of analysis of pigments.

It was announced that the single panel and multiple panel forms for recording results of exposure tests of paints (D 1150 – 51 T) which were developed jointly by the ASTM and the Federation have been well received and are being extensively used in the paint industry.

In its report to the Society, Committee D-1 presented two methods for publication as information covering respectively procedures for determining 20-deg Specular Gloss and 85-deg Sheen. The Method of Test for 60-deg Specular Gloss (D 523–51) was revised and continued as standard.

There were five new Tentatives accepted—two specifications for methanol and methyl isobutyl ketone, and three tests for Purity of acetone, roundness of glass spheres, and for total chlorine in polymers and copolymers used for surface coatings.

A revision of the tentative recommended practice for conducting exterior exposure tests of paints on wood (D 1006–51 T) was accepted.

Improved procedures for the analysis of zinc pigments were incorporated in the methods of chemical analysis of white pigments (D 34 – 47) and this standard was reverted to tentative as further revisions are contemplated.

The specific gravity limits for destructively distilled wood turpentine in the Standard Specifications for Spirits of Turpentine (D 13 – 34) were revised. The methods of Testing and Sampling Turpentine (D 233 – 48) were revised by the addition of new test procedures for determining evaporation residue and acidity. A number of new definitions were added to the standard definitions of terms D 16. Several important revisions were made in the Specifications for Dehydrated Castor Oil (D 169 – 48 T). In addition, Committee D-1 recommended the adoption as Standard of 12 Tentatives under its jurisdiction.

The Subcommittee on Painting of Metals reported that a classification of ferrous surfaces prior to painting was in the final stages of completion. The classification will consist of a set of photographic reference standards in both color and black and white, classifying some 36 different conditions of ferrous surfaces. The committee is now preparing and selecting the photographs to be used. This classification, when available, will be of direct practical day-to-day use to structural maintenance contractors and others concerned with painting operations.

Committee D-2 on Petroleum Products and Lubricants

COMMITTEE D-2 again presented to the Society one of the largest reports (69 pages) as preprinted. The Committee added to its Report for publication as information Proposed Methods of Test for Kinematic Viscosity.

It was announced that its Fall meeting will be held in Chicago at the Drake Hotel, October 7 through 11.

At its annual dinner Committee D-2 honored Donald B. Brooks, a member of the advisory Committee and former chairman of the Research Division on Combustion Characteristics, for his many contributions to the work of the committee. Mr. Brooks was presented with a decorated and appropriately worded scroll signed by members of Committee D-2. William E. Holaday served as toastmaster with Bruno Siegel and Leo A. McReynolds reviewing in a humorous manner the long association of Mr. Brooks with the committee. Music was by "The Four Tentatives" including A. E. Miller, W. R. Power, F. D. Tuemmler, and a "dark horse." M. R. Lipkin headed the dinner committee.

Plans were made for a Symposium on Fretting Corrosion to be held at the 1952 Annual Meeting.

The committee withdrew from its report the proposed revisions in the Specifications for Gasoline (D 439 – 50 T). The proposed revision as preprinted of the Specifications for Aviation Gasoline (D 910 – 50 T) provided for the inclusion of two new grades, namely 80–87 and 108–135. The committee withdrew the proposed grade 108–135, but the other changes, including the new grade 80–87, were accepted. The proposed definition of the term "lubricating grease" which appeared in the report as a part of the revision of Standard Definition D-288 was also withdrawn from the report. The committee also recommended reversion to tentative of the Standard Method of Test for: Steam Emulsion of Lubricating Oils (D 157) without revision, as this method is undergoing review and will either be revised or discontinued.

Revisions were presented in 9 tentatives, covering Specifications for Diesel Fuel Oils (D 975); Tests for Aniline Points (D 611); Oil Content of Wax (D 721); Chlorine in Lubricants (D 808); Evaporation Loss of Greases (D 972); Neutralization Value (D 974); Purity from Freezing Points (D 1016); Boiling Point of Butadiene (D 1088); and Tests for Aromatic Hydrocarbons in Gasol[...] by Silica Gel Adsorption (D 936).

> **Survey of Current Standardization Project in September Bulletin**
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> *An extensive survey of current standardization projects under way in technical committees will appear in the September* BULLETIN.
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> *This survey achieves several purposes. It acquaints the Society officers, the various administrative committees, and the Staff with the standardization work that is under way, and it informs the respective committee officers with work under way in other groups, and thus tends to avoid overlap. Perhaps of paramount importance is that the published summaries afford members a "look ahead" on the specifications and tests which are being developed in the large number of committees.*

Three standards were revised and [...]verted to tentative. These covered T[...] for Distillation (D 447) and for Un[...]fonated Residue of Plant Spray Oils [...] 483) and also an extensively revised T[...] for Carbon Residue by Ramsbottom C[...]ing Procedure (D 524). There were [...] tentatives adopted as standard—[...] without revision and one with m[...] changes. There are four standards to [...] revised by immediate action. Th[...] cover Tests for Flash Point (D 56); [...]fur by the Bomb Method (D 129); N[...]tralization Value (D 664); and De[...]tions of Terms (D 228).

Appended to the Report were sev[...] tables of data for use in connection [...] the two bromine number methods. T[...] data are intended for general use a[...] guide in the interpretation of the [...] methods accepted this year for pub[...]tion as tentative.

The Technical Committee on L[...] Hydrocarbons will present for pub[...]tion as information three (small) sa[...] methods and also reported that a pr[...]dure for determining vapor pressure [...] liquefied petroleum gases is nearing c[...]pletion.

The committee accepted certain [...]torial changes to be made in Test for [...]fur in Petroleum Products and Lu[...]cants by Bomb Method (D 129); [...] Chlorine in Lubricating Oils by B[...] Method (D 808); and for Heat of C[...]bustion of Liquids by Bomb Calorim[...] (D 240), covering precautions that sh[...] be taken with the combustion bomb.

Committee D-2 presented to the [...]ciety for publication as information, [...] proposed methods covering respectivel[...]

(1) Penetration of Lubricating Gre[...] Worked More Than 60 Str[...]
(2) Measurement of Density and [...]cific Gravity of Liquids to [...] Fifth Place (Bingham Pycno[...]ter Method),
(3) Color-Indicator Test for Sapo[...]cation Number of Petrol[...] Products Using Paraphenol [...] Indicator, and

(4) Oil Content of Petroleum Waxes.

Five new methods were accepted as ntative. These cover procedures for termining total inhibitor content of itadiene, two methods for bromine umber of petroleum distillates (one by olor Indicator and the other by Electro-etric Titration), and a method for re-iced pressure distillation of petroleum oducts. The latter three methods have en published as information in 1951, it were accepted as tentative with revi-ons.

easurement Tables:

It was reported that the Petroleum easurement Tables being compiled intly by the ASTM and the Institute of etroleum (London) are now in the final ages of completion. L. C. Burroughs, hairman of the D-2 Division handling e Tables, who had just returned from e Third World Petroleum Congress at e Hague, reported on meetings that he id attended with representatives of the ? at which final decisions were made garding publication of the Tables. has now been decided to publish the lected Tables in three volumes to meet e requirements of all countries, based the following three approved systems measurement: (1) U. S. System; (2) nperial (British) System; and (3) Metric ystem. It is hoped that the U. S. and ritish volumes will be completed and ade available in the Fall of this year. he computation work for the more than 0 pages of Tables which will comprise e three volumes has been done jointly it independently by the ASTM and ?, after the agreement on the basic rmulas and data to be used. Arrange-ents have been made for careful check-g by both the ASTM and IP of the ables at all stages of production so that e data will not only be authoritative, it should also be free of errors. The olume of American Tables will be pub-hed and made available by the ASTM. he British and Metric volumes are being iblished by the IP. It is planned to iblish the text accompanying the Tables three languages, English, French, and oanish. Table headings will, however, opear in English only.

ink Calibration:

The Section on Tank Calibration re-orted completion of comprehensive meth-ls of calibrating liquid containers which e applicable to either stationary or obile upright tanks. These methods are e result of an extensive review made by e working section covering a period of veral years, and after 10 working meet-gs each of two or three days duration. ne proposed methods of calibration will submitted to letter ballot of the D-2 ivision on Sampling and Gaging before ing presented to the main committee.

Committee D-3 on Gaseous Fuels

Committee D-3 on Gaseous uels reported that it had presented four w methods of test to the Society early the year through the Administrative Committee on Standards. These cover Analysis of Natural Gases by the Volumetric Chemical Method (D 1136 – 50 T), Analysis of Natural Gases and Related Types of Gaseous Mixtures by the Mass Spectrometer (D 1137 – 50 T), Test for Water Vapor Content of Gaseous Fuels by Measurement of Dew Point Temperature (D 1142 – 50 T), and Sampling Natural Gas (D 1145 – 50 T).

The Tentative Methods of Test for Specific Gravity of Gaseous Fuels (D 1070 – 49 T) will be revised during the year. Methods of sampling manufactured gas and of liquefied petroleum gases are in preparation. The committee is also developing methods for the preparation of samples for analysis by cooperating laboratories.

The seven methods prepared by Committee D-3 for the testing and analysis of gaseous fuels are now published in a special Society publication under the title "ASTM Standards on Gaseous Fuels." This book comprises some 140 pages.

Committee D-4 on Road and Paving Materials

Committee D-4 adopted a resolution in memory of Roy W. Crum, a member of the committee for forty years and chairman from 1928 to 1930. Shreve Clark, a past-chairman of the committee, was elected an honorary member.

The committee received many recommendations from subcommittees for publication of new tentatives and tentative revisions of standards, and voted to submit these recommendations to letter ballot. These include a new method of test for residue of specified penetration by vacuum distillation, a new method for the determination of specific gravity of compressed bituminous mixtures, tentative specifications for preformed expansion joint filler for concrete and for concrete joint sealer—hot-poured type—together with tentative methods for testing concrete joint sealers. Tentative revisions of the two methods for specific gravity of bituminous road materials, revisions of the tentative methods for sampling bituminous materials, and revisions of specifications for aggregates and asphaltic mixtures for asphaltic concrete and sheet asphalt pavements were also accepted.

Committee D-5 on Coal and Coke

On the recommendation of Committee D-5 on Coal and Coke, the Method of Test for Grindability of Coal by the Hardgrove-Machine Method (D 409 – 37 T) was adopted as standard, and simultaneously action was taken to withdraw the Tentative Method of Test for Grindability by the Ball-Mill Method (D 408–37 T) in view of the almost universal acceptance of the Hardgrove-machine method for commercial use.

The Subcommittee on Coal Sampling has a special section making an investigation of automatic sampling in cooperation with the members of the Prime Mover's Committee, Power Station Chemistry Subcommittee, of the Edison Electric Institute. A test program has been developed to study one coal, using one make of automatic sampler. The scheme is designed to eliminate machine bias in sampling and to provide reliable information on variability (based on analysis of variance) not only in the automatically collected increments, but in hand increments of several sizes collected simultaneously by partitioning the stream on a stopped belt. The ultimate aim is to promote standards which will permit the least cumbersome automatic sampling for large users of crushed or fine coal.

Subcommittee II on Nomenclature and Definitions recommended definitions for "inherent moisture" and "surface moisture" of coal based on equilibration of a "wet" sample of coal at 30 C. and 97 relative humidity. Details of a method for moisture were referred to Subcommittee XXI on Methods of Analysis. The latter subcommittee met to consider further its pending revision of the Ultimate Analysis. Good progress covering details of the apparatus was made. Agreement was also reached to establish three separate sections within Subcommittee XXI dealing respectively with the ultimate analysis, the proximate analysis, and with miscellaneous analytical procedures. Of particular interest is a decision to reconstitute a subcommittee on the physical tests of coke.

Committee D-6 on Paper and Paper Products

At the meeting of Committee D-6, it was announced a joint D-6, D-9 committee has been organized to coordinate work of the two committees, consisting of two members from each committee. Two task groups have already been organized under the direction of the joint committee, and meetings were held during the Annual Meeting. These two groups will study pH problems and air permeability of paper, respectively.

Revised Report on Significance of Tests:

The long-awaited revision of the monograph on significance of tests of paper and paperboard is now being edited and an early printing date is expected. The new edition includes complete rewrites of several of the chapters, as well as the addition of new items. In order to improve the form of new and existing standards prepared by the committee, a task group has been appointed to review existing methods of test and to draw up a standard form for future use.

Committee D-8 on Bituminous Waterproofing and Roofing Materials

The two basic terms "waterproofing" and "dampproofing" have now been defined by the Subcommittee on Definitions subject to letter ballot. This was reported at the meeting of Committee D-8. A proposed method of test and a specification for insulating siding material is being reviewed in the subcommittee. A blistering test for prepared roofings, shingles, and siding materials is now being developed. The several standards dealing with membrane, waterproofing and built-up roofing have been reviewed, with suggested changes being considered dealing

with such matters as softening points, the inclusion of perforated felts and hardness values. Agreement has been reached between the committee and Committee D-4 on a new draft of the Tentative Method of Sampling Bituminous Materials (D 140 T).

A cold flow test has been needed and to obtain data a questionnaire will be circulated to obtain service requirements, temperatures to be considered, rates of loading and what materials have proved to be satisfactory. In reporting on accelerated weathering tests, it was noted that the present equipment is considered satisfactory and that a proposed method for preparation of panels has not yet been agreed upon. Agreement also has not yet been reached on an end-point test method. A proposed specification for bituminous emulsions for built-up roofs was recommended for letter ballot of the committee. The efforts of two subcommittees dealing with stain properties and compatibility tests are now being concentrated on securing data to establish the reproducibility of proposed methods being considered.

Committee D-9 on Electrical Insulating Materials

The committee presented new Tentative Methods of Testing Hydrocarbon Waxes used for Electrical Insulation. These methods apply to mineral waxes of petroleum origin in general, but more specifically to the so-called microcrystalline types used either as electrical insulation or moistureproofing mediums or for treating, impregnating, coating, and filling electrical apparatus.

Important revisions were made in the standard methods of measuring mica stampings used in electronic devices and incandescent lamps. The revised methods describe procedures for measuring the hole spacing, thickness and hole size of small pieces of fabricated natural mica such as bridges, spacers, and supports used in electronic devices and incandescent lamps. The revised method uses a tapered pin dial gage.

The test for insulation resistivity of electrical insulating oils of petroleum origin which appeared in the preprinted report as a revision of Standard D 924 will be published as tentative under its own ASTM designation. Further revisions in Method D 924 are contemplated. The revised Tentative Specifications for Black Bias-Cut Varnished Cloth and Varnished Cloth Tape Used for Electrical Insulation (D 373 – 51 T) were accepted. Action was also taken to accept the revised Methods of Testing Varnished Cloths and Varnished Cloth Tapes Used for Electrical Insulation (D 295 – 51 T), but the committee announced that additional revisions in these methods would be made through the Standards Committee subsequent to the meeting.

Committee D-11 on Rubber and Rubber-Like Materials

It was announced by Committee D-11 that a new Subcommittee on Application of Statistical Quality Control Methods of Rubber Products was being organized.

The activities of the D-11 Subcommittee on Crude Natural Rubber have been of international interest. This is also true of the activities of the Subcommittee on Rubber Latex. One particularly interesting development is the production in Indo-China of a series of specially controlled crude rubbers which are technically graded according to viscosity and rate of cure. These rubbers are now available and are being investigated further by the committee.

Committee D-11 presented to the Society a complete set of Purchase Specifications for Gasket Materials for General Automotive and Aeronautical Purposes (D 1170 – 51 T). The specifications cover materials composed of natural rubber, synthetic rubber, cork, treated and untreated papers, asbestos, and various combinations of these materials. These specifications were prepared by the SAE-ASTM Joint Technical Committee on automotive rubber and represent the culmination of several years of work which involved an extensive study of a large number of gasket materials used for a variety of automotive and similar applications.

Another very important action by the Joint Committee was the completion of an extensive revision of the Tentative Specifications for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications (D 735 – 51 T). The nature of the changes in the specifications is discussed further elsewhere in this issue of the Bulletin.

The Joint Committee also prepared the new Method of Test for Weather Resistance Exposure of Automotive Rubber Compounds (D 1171 – 51 T).

Committee D-11 reported that a number of recommendations had been presented to the Society just previous to the Annual Meeting and accepted by the Standards Committee. These covered new Methods of Test for Compressibility and Recovery of Gasket Materials (D 1147 – 51 T), Test for Accelerated Ozone Cracking of Vulcanized Rubber (D 1149 – 51 T) and Tests for Discoloration of Vulcanized Rubber (D 1148 – 51 T).

Revisions were also made in eight other tentative methods and specifications.

Committee D-11 presented to the Society the first Emergency Alternate Provisions, under the new procedure approved by the Board of Directors. These apply to the Specifications for Friction Tape for General Use for Electrical Purposes (D 69 – 48 T) and for Rubber Insulating Tape (D 119 – 48 T). In both, the reduced allocation of crude rubber made necessary the establishment of the emergency provisions. In Specifications D 69 the adhesion test after oven aging is omitted and the permissible number of pinholes is slightly increased. In D 119 the requirement for natural rubber was eliminated and the limitations on tensile strength, elongation, and dielectric strength have been somewhat modified.

The Subcommittee on Protective Equipment for Electrical Workers, which also functions as ASA Sectional Committee J-6, submitted to Committee D-11 completely revised specifications for rubb insulating gloves. The specifications co three classes of gloves, differing in thi ness and having proof test voltages 10,000, 15,000, and 20,000 respective applied for three minutes. The specifi tions set forth the requirements for t electrical characteristics and the mecha cal strength of gloves used for protecti of electrical workers from electric sh while working on energized conductors a equipment. The specifications will submitted to the ASTM for publicati and also submitted to the ASA for a proval as American Standards.

Committee D-13 on Textile Materials

The committee present to the Society new Methods of Test Resistance to Abrasion of Textile Fabr which describe in detail five differe types of abrasion testing procedures follows:

A. Inflated Diaphragm Method
B. Flexing and Abrasion Method
C. Oscillatory Cylinder Method
D. Rotary Platform, Double He Method
E. Uniform Abrasion Method

These methods were developed by Task Group after several years study b series of cooperative tests.

The Methods of Test for Appar Fluidity of Dispersion of Cellulose Fib (D 539 – 51 T) were revised. A numb of changes were made in the prese Method B and a new Method C cover dispersions of cellulose nitrate in orga solvents has been included. Revisi were submitted in three other tentati including a number of new definitic Also four tentatives were adopted standards, tentative revisions issued for standards, and two standards revised immediate action.

Committee D-15 on Engine Antifreeze

Committee D-15 presen to the Society a new tentative Metho Test for Freezing Point of Aqueous Eng Antifreeze Solutions. This method completed after several years study it is expected will be widely used si this is the most general test used by au mobile service stations in checking a freeze solutions. The Specifications the Hydrometer Thermometer F Tester (D 1124 – 50 T) used in this meth were issued last year.

Another very important new tenta method covered procedures for Sampl and Preparing Aqueous Solutions of gine Antifreeze. This method cov directions for obtaining samples of c mercial antifreeze from the original c tainer, and also for separation of the wa soluble phase for the preparation of ac ous solutions. This method of samp and preparing solutions will be used connection with the five tentative meth of test completed by Committee D-15 year.

The cooperative laboratory test gram on simulated and actual service t

ıg is still continuing. An extensive progress report was presented to the committee at a recent meeting summarizing the collaborative work on the glassware bench test and the modified Bureau of Standards circulating test for corrosion. Due to the limitations of the glassware bench test it will be used as a screening tool in connection with the circulating test. Study is being made of the wealth of data obtained in this investigation.

A very interesting and up-to-date article on the selection and use of engine antifreeze has been completed and plans are being made for its publication in the Fall of this year.

Committee D-16 on Industrial Aromatic Hydrocarbons

Essential completion of the original objectives of Committee D-16 has necessitated consideration of plans for future activity. All of the 12 specifications and 9 methods of test prepared by Committee D-16 are now ASTM standards. These D-16 Standards are available from Society Headquarters in a special publication entitled "ASTM Standards on Benzene, Toluene, Solvent Naphtha." After considerable study and discussion of the matter by the Committee, the following revised scope has been adopted by letter ballot of the Committee and approved by the Board of Directors of the Society:

> *Scope.*—Nomenclature, specifications, and methods of test of those aromatic and heterocyclic chemicals generically classed as coal chemicals whether derived from coal, petroleum, or any other source, by synthesis or physical separation, and used industrially, either alone or as mixtures, as intermediates or solvents.

The present D-16 Subcommittees are being consolidated into a single subcommittee, and three new Subcommittees are to be appointed as follows:

1. To handle polycyclic hydrocarbons of the naphthalene, phenanthrene, anthracene types.
2. To handle phenols, both monohydric and polyhydric.
3. To handle heterocyclic nitrogen compounds, specifically of the pyridine and quinoline families.

The personnel of Committee D-16 will be enlarged to include representatives from companies interested in the enlarged scope of activity. The committee will be glad to consider applications for membership.

The Tentative Method of Test for Specific Gravity of Industrial Aromatic Hydrocarbons (891 – 46 T) was adopted as standard, with a revision stating that in cases of dispute, Method C shall be used as the referee test.

Committee D-17 on Naval Stores

Committee D-17 on Naval Stores submitted several revisions in its report as preprinted. It voted to adopt as standard the Tentative Method of Test for Tall Oil (D 803 – 49 T), but with certain revisions subject to subsequent letter ballot approval of the committee.

Additional revisions were also submitted in the Tentative Method of Test for Acid Numbers of Rosin (D 465 – 49 T) which is also being adopted as standard; likewise additional changes were presented in the Tentative Method of Test for Saponification Number of Rosin (D 464 – 49 T) which is to be adopted as standard.

The report as preprinted had recommended the adoption as standard with revisions of the Tentative Method of Test for Unsaponifiable Matter in Rosin (D 1065 – 45 T). The committee recommended that this method be continued as tentative with the revisions as preprinted.

The proposed Tentative Definitions of Terms Relating to Naval Stores and Related Products were accepted as preprinted except that the Definitions for Ester Gum and Gloss Oil were revised to read as follows:

> *Ester Gum*—A resin made from rosin or rosin acids and a polyhydric alcohol, such as glycerine or pentaerythritol.
>
> *Gloss Oil*—A solution of limed rosin or limed rosin acids in a volatile solvent used chiefly in surface coatings. (When made from tall oil, the source is usually indicated.)

Committee D-18 on Soils for Engineering Purposes

In addition to sponsoring two symposiums on soils at the Annual Meeting, Committee D-18 held several meetings. In the field of borings and sampling for soil investigation, a proposed method for use with embankment material is now in its second revision. A proposed method for split-spoon and thin wall tube sampling is expected to be completed during the coming year. Progress was reported in general as noted in the Annual Report for other activities of the Committee.

The Section on Triaxial Loading is now compiling various procedures used for triaxial shear testing. A symposium is being planned for presentation at the 1952 Annual Meeting on physicochemical properties of soils. This will include the presentation of basic data and procedure, as well as application.

Three proposed methods for conducting plate loading tests have been referred to the specifications and test method subcommittee for review and promulgation as new tentatives; the tests consisting of nonrepetitive, repetitive and spread footing load tests. Consideration is being given to a proposed tentative method for lateral load test and a symposium being planned for 1953 on the subject.

Committee D-19 on Industrial Water

The well-attended meeting of Committee D-19 indicated that the present high level of activity in the committee will be more than equaled during the coming year. In addition to the work on new methods and revisions of present methods, the committee is assembling material for a symposium on "Continuous Methods of Water Analysis" which it wishes to sponsor at the Annual Meeting of the Society in 1952. The "Manual on Industrial Water" is expected to be completed during the year.

The committee reported acceptance by the Administrative Committee on Standards of the proposed Tentative Specifications for Substitute Ocean Water (D 1141 – 50 T).

In its report to the Society, Committee D-19 presented new methods of test for chloroform-extractable matter (D 1178 – 51 T) and for fluoride ion (D 1179 – 51 T), and also an extensive revision of the methods of test for acidity and alkalinity (D 1067).

The committee reported on its activities toward promoting cooperation with other national societies that prepare and publish methods of analysis of water, seeking coordination of work and uniformity in standard methods of the various groups for similar determinations. The paper "Industrial Water and Water-Borne Industrial Waste," which was published in the Bulletin (July, 1950), summarizing the activities of Committee D-19 was sponsored by the committee in the interest of fostering such cooperation.

The Subcommittee on Sampling reported that after careful study of the Tentative Methods for Sampling Boiler Water (D 860 – 48 T) revisions are ready for letter ballot. Also completed are specifications for equipment for sampling industrial water and steam. Consideration was given to a proposed method of sampling water and steam at subatmospheric pressure.

The Subcommittee on Methods of Analysis, which completed the new and revised tentatives mentioned earlier, reported that work on the following new tests is under way: clarity, turbidity, and color; hydrogen; sulfide ion; iodide and bromide ions; chlorine residuals; titrimetric hardness; heavy metals; nitrites; phosphates; oxidation-reduction; chemical microscopy; chemical analysis of water-formed deposits; total carbon; sufur dioxide; ammonia; and sodium and potassium by flame photometry. It is expected that the methods for bromide and iodide, chlorine residuals, nitrites, and chemical microscopy, and possibly others, will be submitted to letter ballot later this year. A modification of the "Schwartz-Gurney B" method for dis solved oxygen is being studied for inclusion in Methods D 888 as a nonreferee method. Progress was also reported on preparation of a master scheme for chemical analysis of industrial water.

The Subcommittee on Classification reported that specifications for two grades of reagent water have nearly been completed.

The Subcommittee on Methods of Testing is preparing a proposed revision of the Method of Corrosivity Test of Industrial Water (USBM Embrittlement Detector Method) (D 807) to clarify some ambiguities in the present method.

The Subcommittee on Water-Borne Industrial Wastes reported that work is in progress on development of methods for toxicity to aquatic life, chlorine demand,

oxygen demand, oily matter, odor, and phenolic-type compounds. A proposed method of sampling and methods of reporting results are being studied.

Committee D-20 on Plastics

COMMITTEE D-20 is participating in the International Standards Organization to promote international standardization in the Plastics field. The secretariat for the ISO Technical Committee 61 on Plastics has been assigned to the ASA and Committee D-20 has been requested to assist. A special committee under the chairmanship of E. B. Cooper has been formed to handle the secretarial duties. Plans are being made for a meeting of the ISO committee to be held in New York City on September 17 and 18.

Prior to the annual meeting, Committee D-20 had submitted to the Society through the Standards Committee, a number of recommendations which were accepted on March 2. These comprise revised tentative specifications for Cellulose Acetate Molding Compounds (D 706 – 51 T) and for Cellulose Acetate Butyrate Molding Compounds (D 707 – 51 T), also revisions of the Test for Repeated Flexural Stress (Fatigue) of Plastics (D 671 – 51 T), Method for Long-Time Tension Tests of Plastics (D 674 – 51 T), and Methods of Conditioning Plastics and Electrical Insulating Materials for Testing (D 618 – 51 T). The latter was presented jointly with Committee D-9.

With its report, Committee D-20 submitted new Tests for Bursting Strength of Round Rigid Plastic Tubing (D 1180 – 51 T); for Warpage of Sheet Plastics (D 1181 – 51 T); and for Apparent Density and Bulk Factor or Granular Thermoplastic Molding Powder (D 1182 – 51 T).

A number of new and revised definitions of terms were also submitted as tentative, but the committee withdrew two definitions as preprinted covering the terms "polyester plastics" and "resin."

The Committee withdrew from its report the recommendation for adoption of the Tentative Recommended Practice for Transfer Molding of Specimens of Phenolic Materials (D 1046 – 49 T).

An important revision in Specifications for Molds for Test Specimens of Plastic Molding Materials (D 647 – 50 T) covered a new semi-automatic compression mold for molding tension test specimens.

Committee D-20 announced that its Fall meeting would be held in conjunction with Committee D-9 at Niagara Falls, Canada, during the week of November 12.

At its meeting Committee D-20 took action to submit several new methods and revisions of existing tentatives to letter ballot vote for presentation to the Standards Committee during the Summer. The new tentatives comprise Tentative Specifications for Alkyd Molding Compounds, a Method of Test for Volatile Loss of Plasticizer.

The four tentative methods being revised are Test for Compressive Strength of Plastics (D 695 – 49 T), Test for Brittle Temperature of Plastics and Elastomers (D 746 – 44 T), Specifications for Vinylidene Chloride Molding Compounds (D 729 – 44 T), and the definitions of terms appearing in the Method of Test for Tensile Properties of Plastics (D 638 – 49 T).

The two existing Standards D 760 and D 761 covering Enclosures for Testing Machines both below and above room temperature have been extensively revised and combined and will be reverted to tentative.

Presentation of Gavel to E-3 Chairman

The above illustration depicts the ceremony in which the chairman of Committee E on Chemical Analysis of Metals was presented with the gavel which the committee h previously given to the late G. E. F. Lundell as first chairman of the committee, and wh Mrs. Lundell has asked be henceforth given to each chairman of E-3 during his term office. From left to right the illustration shows H. Kirtchik, Secretary of Committee E D. R. Evans, a charter member and past chairman of the committee; H. V. Church another charter member of the committee, and chairman for many years of its s committee on aluminum and magnesium; J. W. Stillman, present chairman of committee; and H. A. Bright, also a charter member of the committee and now honorary chairman.

"E" Group

Committee E-2 on Emission Spectroscopy

DURING the past year, Committee E-2 has submitted 36 suggested methods of emission spectrochemical analysis to the Society for publication as information only. Several additional suggested methods will soon be submitted. It is expected that a compilation of the methods will be available before the end of this year.

While Committee E-2 will continue to compile suggested methods, in order to make available as useful information procedures that have been used satisfactorily, the committee feels that it is now in a position to undertake again the writing of tentative methods for emission spectrochemical analysis. During the coming year the committee expects to submit several proposed tentatives to the Society through the Administrative Committee on Standards.

An attendance of about 100 and active discussion from the audience were evidence of the favorable reception given the symposium on "Chemical Analysis of Inorganic Solids by Means of the Mass Spectrometer" which was held as a special technical papers session of Committee E-2. A more detailed statement about this symposium appears elsewhere in this BULLETIN.

Committee E-3 on Chemical Analysis i Metals

SINCE the 1950 Ann Meeting, Committee E-3 has submitted new and revised methods to the Soci through the Administrative Commit on Standards. Among the new meth are photometric methods for the chem analysis of aluminum, methods for chemical analysis of nickel-copper all and methods for the chemical analysi antimony. The new and revised meth are all included in the 1950 Book of AS Methods for Chemical Analysis of Me

All of the methods are currently b reviewed to determine where greater sp accuracy, or ease of operations can achieved through new or revised pr dures. In order to further round out coverage provided, Committee E-3 is veloping methods for the chemical anal of beryllium-copper alloys, titanium its alloys, high nickel-chromium all and electronic nickel. Progress was ported in the development of a met for determination of small amounts aluminum in lead and zinc-base alloys.

As a result of the continuing demand an up-to-date bibliography on photome methods for chemical analysis of met J. W. Stillman has prepared such a liography which will be published l this year.

A high light of the main meeting Committee E-3 was the presentation the chairman, J. W. Stillman, of the g which had originally been presented Committee E-3 to the late G. E. F. Lun as the guiding spirit and first chairma Committee E-3. The gavel had been turned to the committee by Mrs. Lun with the request that it should be g to the present chairman and then pa on to each succeeding chairman of C mittee E-3 as he takes office.

Committee E-4 on Metallography

COMMITTEE E-4 has con-[cut]cted a favorable letter ballot on a revi-[cut]n of the Recommended Practice for [cut]ermal Analysis of Steel (E 14 – 33) to [cut] entitled Tentative Recommended Prac-[cut]e for Thermal Analysis of Metals and [cut]loys and this will be offered for publica-[cut]n by the Society in 1951. A Proposed [cut]ethod for Estimating the Average Grain [cut]e of Non-Ferrous Metals and Alloys [cut]her than Copper and Copper-Base [cut]loys has been approved and should be [cut]ued during 1951. This new method [cut]ludes standard grain size photographs [cut] both twinned and untwinned mate-[cut]ls, and also includes procedures for [cut]imating macrograin sizes up to the order [cut]1 in. av. grain diam.

Still in process is the extensive com-[cut]ation and editing of definitions of the [cut]ny hundreds of approved metallo-[cut]phic terms.

Due to the outstanding success of the [cut]otomicrographic exhibits held in con-[cut]ction with Annual Meetings and the [cut]h value of achievement they repre-[cut]t, plans are already under way for the [cut]52 display to be held in New York City [cut]d special efforts will be made to en-[cut]rage participation by students.

[Co]mmittee E-7 on Non-Destructive Testing

A PROPOSED tentative recom-[cut]nded practice for radiographic testing [cut]s reached final draft form and will be [cut]lloted upon within Committee E-7. [Co]nsideration is continuing of a proposed [me]thod for magnetic particle testing by [th]e dry powder method.

Work has been started in the ultrasonic [tes]ting field on five separate projects in-[clu]ding procedures for reflection and reso-[nan]ce methods, development of calibration [blo]cks for these methods, and a glossary of [ter]ms.

A Committee E-7 technical session was [hel]d on June 19 at which the following [pap]ers were presented:

The Development of X-ray Standards for Shielded Arc Welds in Aluminum —J. J. Hirschfield, D. T. O'Connor, J. J. Pierce, and D. Polansky

A Small Focal Spot, Short Duration Flash X-ray Generator—E. Criscuolo and D. T. O'Connor

Electrified Particle Inspection for Studying Cracks in Glass and Porcelain Enamel—Henry M. Staats

Study of Magnetic Fields at a Crack in a Magnetized Steel Plate—R. D. Kodis and G. A. Darcy

Latest Development in Xeroradiography—M. D. Phillips, R. C. McMaster, and S. A. Wenk

Committee E-9 on Fatigue

A NEW project in Committee E-9 which should possibly be of as much use to those interested in fatigue as has been the "Manual on Fatigue Testing" is the publication of a bibliography on fatigue. The development of this bibliography is in a preliminary stage. In an attempt to ascertain what reception might be given to a comprehensive card file bibliography containing several thousand references, a reasonably complete list of 1950 abstracts (not on cards) will be prepared by the Ozalide process and distributed through ASTM Headquarters.

A new Subcommittee on Large Machines and Test Correlation has been formed under the chairmanship of John M. Lessells. Its initial work will be the preparation of a summary of previous work on size effect, exploration of testing equipment now used by the Bureau of Ships, development of a test program, and the raising of funds to carry out such a test program.

The Survey Subcommittee has collected from the membership of Committee E-9 eleven problem statements for the Administrative Committee on Research.

The committee has continued its practice of advising on fatigue papers proposed for the Annual Meeting, and this year 13 papers were accepted on the committee's recommendation.

Committee E-11 on Quality Control of Materials

COMMITTEE E-11 reported that the new ASTM Manual on Quality Control of Materials which became available in March had been very well received, as evidenced by the fact that the first printing of 5000 copies was exhausted and a second printing was now available.

The Symposium on Bulk Sampling held at Annual Meeting was sponsored by Committee E-11.

There are five new Task Groups actively working on the following subjects:

1. Survey of Sampling Plans in ASTM Standards
2. Preparation of recommended practices for planning of interlaboratory tests
3. Development of procedures for determining the number of tests for a desired precision of an average
4. The fitting of curves for a linear relationship, and
5. Study of problems concerned with the use of the terms "precision" and "accuracy."

Committee E-11 has continued to assist and advise ASTM committees and members of the Society on problems covering various phases of the application of statistical methods to ASTM problems.

Committee E-12 on Appearance

COMMITTEE E-12 reported that the various papers and reports presented at the full-day two session sponsored by the Committee in Washington on February 27, are now available in a limited number from ASTM Headquarters. The general theme of this February meeting was "Appearance, Its Description, Measurement and Specification—A Study of What Is Being Done by Others and What Needs to Be Done."

In addition to reports from representatives of a large number of ASTM Committees, papers were also presented by representatives of the Inter Society Color Council, American Standards Association, Optical Society of America, Illuminating Engineering Society, International Commission on Illumination, and American Association of Textile Chemists and Colorists.

A limited number of copies of the papers and reports presented at this meeting are also available on request to ASTM Headquarters.

Committee E-12 is now reviewing the information presented at this session as a basis for developing a program of work.

[M]ethods of Measuring Viscosity at High Rates of Shear

THE Symposium on [M]ethods of Measuring Viscosity at [Hi]gh Rates of Shear" has recently been [pu]blished. The purpose of this sym-[pos]ium was to find a suitable method [for] testing viscosity at high rates of [she]ar of various additives used in lubri-[can]ts and other fluids. Existing meth-[od]s proved unsatisfactory due to un-[kno]wn temperature values; therefore, [tw]o promising methods were investi-[gat]ed and are described in detail in this [rep]ort.

One is the test method which has [bee]n extensively utilized in measuring viscosity of hydraulic oils at Pennsylvania State College. In this method capillaries are used to measure viscosity. The other one, involving the use of the Kingsbury tapered-plug instrument, uses a sleeve bearing for measurements. For the test purposes, four oils were used. Two were well-refined mineral oils of 155 and 55 Saybolt seconds viscosity-shear, respectively, at 100 F, being Newtonian in their viscosity-shear properties. A low and high molecular weight polymer were used in the preparation of the other two oils, the polymer blends being non-Newtonian in their viscosity-shear behavior.

The data secured by the two methods show that the two viscometers yield values of about the same precision and reproducibility, the maximum difference is approximately 6 percentage units in viscosity decrease. The agreement between the two instruments is poorest at 210 F, the best agreement for the oil with the high molecular blend is at 150 F, and for the oil with the low molecular blend at 100 F.

This 50-page Symposium (STP No. 111) is bound in heavy paper and is priced at $1.35. The price for members is $1.

List of New and Revised Tentatives with Serial Designation

THE Society accepted at the Annual Meeting 55 new tentatives and revisions in 91 former tentative specifications and methods of test. Of the revised tentative specifications and methods, 21 have been extensively revised and the titles are given below (marked with an asterisk) with the list of those issued by the Society for the first time. In addition, 6 standards have been extensively revised and reverted to tentative status. Technical committees responsible for the various items are indicated.

Steel

(*Committee A-1*)

Specifications:

Nickel-Chromium-Molybdenum Steel Bars for Springs (A 332 – 51 T).
Alloy Steel Seamless Drum Forgings (A 336 – 51 T).
Seamless and Welded Steel Tubes for Low-Temperature Service (A 334 – 51 T).
Seamless Ferritic Alloy Steel Pipe for High-Temperature Service (A 335 – 51 T).

Cast Iron

(*Committee A-3*)

Specifications:

*Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650 F (A 278 – 51 T).

Corrosion of Iron and Steel

(*Committee A-5*)

Specifications:

Zinc-Coated Iron or Steel Chain-Link Fence Fabric Galvanized Before Weaving (A 337 – 51 T).

Wires for Electrical Conductors

(*Committee B-1*)

Specifications:

Tinned Hard-Drawn and Medium-Hard-Drawn Copper Wire for Electrical Purposes (B 246 – 51 T).
*Hard-Drawn Copper Wire (B 1 – 51 T) (Revision of standard and reversion to tentative).

Copper and Copper Alloys, Cast and Wrought

(*Committee B-5*)

Specifications:

General Requirements for Wrought Copper and Copper Alloy Plate, Sheet, Strip, and Rolled Bar (B 248 – 51 T).
General Requirements for Wrought Copper and Copper Alloy Rod, Bar, and Shape (B 249 – 51 T).
General Requirements for Wrought Copper Alloy Wire (B 250 – 51 T).
General Requirements for Wrought Seamless Copper and Copper Alloy Pipe and Tube (B 251 – 51 T).

Electrodeposited Metallic Coatings

(*Committee B-8*)

Recommended Practices:

Preparation of Zinc-Base Die Castings for Electroplating (B 252 – 51 T).
Preparation of and Electroplating on Aluminum Alloys (B 253 – 51 T).
Preparation of and Electroplating on Stainless Steel (B 254 – 51 T).

Metal Powders and Metal Powder Products

(*Committee B-9*)

Specifications:

Sintered Metal Powder Structural Parts Form Bronze (B 255 – 51 T).

Cement

(*Committee C-1*)

Method of Test:

Time of Setting of Hydraulic Cement by the Gillmore Needle (C 266 – 51 T).
*Time of Setting of hydraulic Cement by the Vicat Needle (C 191 – 51 T).

Chemical-Resistant Mortars

(*Committee C-3*)

Method of Test:

Chemical Resistance of Hydraulic Cement Mortars (C 267 – 51 T).

Refractories

(*Committee C-8*)

Methods of Test:

Modulus of Rupture of Castable Refractories (C 268 – 51 T).
Permanent Linear Change of Castable Refractories (C 269 – 51 T).

Mortars for Unit Masonry

(*Committee C-12*)

Specifications:

Mortar for Unit Masonry (C 270 – 51 T).

Structural Sandwich Constructions

(*Committee C-19*)

Methods of Test:

Water Absorption of Core Materials for Structural Sandwich Constructions (C 272 – 51 T).
Density of Core Materials of Structural Sandwich Construction (C 271 – 51 T).

Method:

Shear Test of Sandwich Constructions in Flatwise Plane (C 273 – 51 T).

Definitions:

Terms Relating to Structural Sandwi[ch] Construction (C 274 – 51 T).

Paint, Varnish, Lacquer, and Relat[ed] Products

(*Committee D-1*)

Specifications:

Methanol (Methyl Ethyl) (D 1152 – T).
Methyl Isobutyl Ketone (D 1153 – T).

Methods:

Test for Purity of Acetone and Meth[yl] Ethyl Ketone (D 1154 – 51 T).
Test for Roundness of Glass Sphe[res] (D 1155 – 51 T).
Test for Total Chlorine in Polyvi[nyl] Chloride Polymers and Copolym[ers] Used for Surface Coatings (D 115[6] – 51 T).
*Chemical Analysis of White Pigme[nts] (D 34 – 47) (Revision of standard a[nd] reversion to tentative).

Recommended Practice:

*Conducting Exterior Exposure Te[sts] of Paint on Wood (D 1006 – 51 T).

Petroleum and Petroleum Product[s]

(*Committee D-2*)

Methods of Test:

Total Inhibitor Content (*p*-Tertia[ry] Butycatechol) of Butadiene (D 115[7] – 51 T).
Bromine Number of Petroleum Dis[til]lates (Color Indicator Method) (D 1158 – 51 T).
Bromine Number of Petroleum Dis[til]lates (Electrometric Method) (D 1159 – 51 T).
Reduced Pressure Distillation of Pe[tro]leum Products (D 1160 – 51 T).
*Aniline Points and Mixed Aniline Po[ints] of Petroleum Products and Hy[dro]carbon Solvents (D 611 – 51 T).
*Chlorine in Lubricating Oils [and] Greases by the Bomb Method (D 808 – 51 T).
*Aromatic Hydrocarbons in Olefin-F[ree] Gasolines by Silica Gel Adsorp[tion] (D 936 – 51 T).
*Evaporation Loss of Lubrica[ting] Greases and Oils (D 972 – 51 T).
*Determination of Purity from Free[zing] Points (D 1016 – 51 T).
*Distillation of Plant Spray Oils (D 4[47 –] 51 T) (Revision of standard and [re]version to tentative).
*Unsulfonated Residue of Plant Sp[ray] Oils (D 483 – 51 T) (Revision [of] standard and reversion to tentati[ve]).
*Carbon Residue of Petroleum Prod[ucts] (Ramsbottom Carbon Residue) [(D] 524 – 51 T) (Revision of standard [and] reversion to tentative).

Paper and Paper Products

(*Committee D-6*)

Methods of Test:

Chloride Content of Paper and P[aper] Products (D 1161 – 51 T).

Water-Soluble Matter in Paper (D 1162 – 51 T).
Lint of Paper Towels (D 1163 – 51 T).
Ring Crush of Paperboard (D 1164 – 51 T).
*Analytical Filter Papers (D 981 – 51 T).
*Water Vapor Permeability of Paper and Paperboard (D 988 – 51 T).

Wood

(*Committee D-7*)

Method of Test:

Methoxyl Groups in Wood (D 1166 – 51 T).

Definitions:

Terms Relating to Wood (D 1165 – 51 T).

Bituminous Waterproofing and Roofing Materials

(*Committee D-8*)

Methods of Testing:

Asphalt-Base Emulsions for Use as Protective Coatings for Built-Up Roofs (D 1167 – 51 T).

Electrical Insulating Materials

(*Committee D-9*)

Specifications:

*Black Bias-Cut Varnished Cloth Tape Used for Electrical Insulation (D 373 – 51 T).

Methods of Testing:

Hydrocarbon Waxes Used for Electrical Insulation (D 1168 – 51 T).
Insulation Resistivity of Electrical Insulating Oils of Petroleum Origin (D 1169 – 51 T).
*Varnished Cloth and Varnished Cloth Tapes Used in Electrical Insulation (D 295 – 51 T).

Rubber and Rubber-Like Materials

(*Committee D-11*)

Specifications:

Gasket Materials for General Automotive and Aeronautical Purposes (D 1170 – 51 T).

Method of Test:

Weather Resistance Exposure of Automotive Rubber Compounds (D 1171 – 51 T).

Soaps and Other Detergents

(*Committee D-12*)

Specifications:

*Chip or Granular Soap for Low-Temperature Washing (Low and Medium Titer) (D 1111 – 51 T).

Methods of Test:

pH of Aqueous Solutions of Soaps and Detergents (D 1172 – 51 T).
Foaming Properties of Surface-Active Agents (D 1173 – 51 T).

Textile Materials

(*Committee D-13*)

Methods of Test:

Resistance to Abrasion of Textile Fabrics (D 1175 – 51 T).
*Apparent Fluidity of Dispersions of Cellulose Fibers (D 539 – 51 T).

Definitions:

*Terms Relating to Textile Materials (D 123 – 51 T).

Adhesives

(*Committee D-14*)

Method:

Determining the Effect of Bacterial Contamination on the Permanence of Adhesive Preparations and Adhesive Bonds (D 1174 – 51 T).

Engine Antifreezes

(*Committee D-15*)

Methods:

Test for Freezing Point of Aqueous Engine Antifreeze Solutions (D 1177 – 51 T).
Sampling and Preparing Aqueous Solutions of Engine Antifreeze (D 1176 – 51 T).

Naval Stores

(*Committee D-17*)

Definitions:

Terms Relating to Naval Stores and Related Products (D 804 – 51 T).

Industrial Water

(*Committee D-19*)

Methods of Test:

Chloroform-Extractable Matter in Industrial Water (D 1178 – 51 T).
Fluoride Ion in Industrial Water (D 1179 – 51 T).
*Acidity and Alkalinity in Industrial Water (D 1067 – 51 T).

Plastics

(*Committee D-20*)

Methods of Test:

Bursting Strength of Round Rigid Plastic Tubing (D 1180 – 51 T), jointly with Committee D-9.
Measuring Warpage in Sheet Plastics (D 1181 – 51 T).
Apparent Density and Bulk Factor of Granular Thermoplastic Molding Powder (D 1182 – 51 T).

Definitions:

*Terms Relating to Plastics (D 883 – 51 T).

Methods of Testing

(*Committee E-1*)

Methods:

*Compression Testing of Metallic Materials in Other Than Sheet Form (E 9 – 51 T).
*Compression Testing of Metallic Materials in Sheet Form (E 78 – 51 T).
*Test for Softening Point (Ball and Shouldered Ring Apparatus) (E 28 – 51 T).
*Tension Testing of Metallic Materials (E 8 – 51 T) (Revision of standard and reversion to tentative).

Recommended Practice:

*Analysis by Microscopical Methods for Particle Size Distribution of Particulate Substances of Subsieve Size (E 20 – 48 T).

Recent Actions Affect Standards on Thermal Insulation, Cement, Rubber, Adhesives, and Paint

Emergency Provisions Approved

During May and June the Administrative Committee on Standards approved several new tentative specifications, tentative revisions of existing test methods, and new tentative methods of test. The specific approvals by the Administrative Committee are listed in the accompanying table. Some notes on the recommendations from the respective technical committees are outlined below.

Thermal Insulating Materials

The Standards Committee has approved several recommendations submitted by Committee C-16. The first of these is a tentative specification for Mineral Wool Blanket Insulation (C 263 – 51 T). This particular specification covers the composition, dimension, and physical properties of metal mesh covered mineral wool blanket insulation intended for insulating heated surfaces. The specification states that "the blanket insulation shall consist of units each composed of mineral wool fibers without binders added, covered by flexible metal fabric facings and held together by heat-resistant ties extending through from one face to the other. The mineral wool shall be rock, slag, or glass processed from a molten state into fibrous form."

In addition tentative specifications for mineral wool industrial batt insu-

lation (C 262 – 51 T) and for mineral wool felt insulation (C 264 – 51 T) were approved. Both materials are of the same composition, processed from a molten state into fibrous form. The industrial batt consists of wool without binders added, furnished in flat sheets and in rolls, while the wool felt insulation is to be manufactured in semirigid form, furnished in flat sheets and in rolls.

Cement

The tentative method of test for determining the presence of calcium sulfate in hydrated portland cement mortar (C 265 – 51 T) has also been approved. This method of test is intended for use in determining the optimum gypsum content for a given portland cement. The amount of SO_3 present in a water extract of ground hardened mortar indicates the extent to which the calcium sulfate has reacted in the hydration process. With suitable limits, the test may be used to establish whether or not calcium sulfate has been used in excess or in an amount less than that required for optimum retardation.

Pigments

The revision approved by the Standards Committee applies to tentative specification for venetian red (D 767 – 50 T). This revision will permit a maximum of calcium carbonate of 4.0 per cent in all three types of venetian red covered by these specifications. The present maximum limit is 0.1 per cent.

Rubber and Rubber-Like Materials

A new tentative method of test for compressibility and recovery of gasket material (D 1147 – 51 T) has been approved. This method is not intended as a test for compressibility under prolonged stress application, nor in fact for tests at other than room temperature. The method pertains only to the determination of the short-time compressibility and recovery at room temperature of sheet gasketing materials and in certain cases gaskets cut from these. It is stated that "the specimen to be tested shall have at least an area of 1 square inch, shall consist of a single ply or a number of superimposed plies sufficient to give a minimum thickness of $\frac{1}{16}$ in. for all materials except cork compositions and rubber compositions containing cork, for which the minimum thickness shall be $\frac{1}{8}$ in."

By another new tentative test the discoloration of vulcanized rubber covered with an organic finish can be evaluated (D 1148 – 51 T). The change in color of the rubber is caused through heat and sunlight and the method is established to provide standard conditions for producing and evaluating this discoloration.

Ozone cracking of rubber under strain when exposed to weather as in automotive uses has been very difficult to evaluate. This is the basis for a new tentative method of test "the accelerated ozone cracking of vulcanized rubber" (D 1149 – 51 T), applicable to the vulcanized rubber materials when exposed under tension, to air containing a definite, low volume of ozone. It is pointed out that this method cannot be expected to correlate wholly with outdoor exposure tests since in the latter tests the effects of light catalyzed oxidation and leaching by water are present, in addition to the variations in temperature of exposure and different volume of ozone.

A number of proposed revisions of tentative methods of testing recommended by Committee D-11 have been approved. These revisions of tentative methods of testing pertain to a number of subjects and are more specifically concerned with: flat rubber belting (D 378 – 50 T); rubber hose containing woven wire reinforcement (D 380 – 50 T); dynamic testing for ply separation and cracking of rubber products (D 430 – 49 T); changes in properties of rubber and rubber-like materials in liquid (D 471 – 49 T); automotive hydraulic brake hose (D 571 – 48 T); asphalt composition Battery containers (D 639 – 49 T); contact and migration stain of vulcanized rubber in contact with organic finished (D 925 – 47 T), and finally revision of tentative specification for rubber and synthetic rubber compounds for automotive and aeronautical applications (D 735 – 48 T).

These new and revised tentatives have been published in their latest form in the 1951 Compilation of Standards on Rubber and Rubber-like Materials, issued in May.

Adhesives

The Administrative Committee accepted a new tentative recommended practice for determining the effect of moisture and temperature on adhesive bonds (D 1151 – 5T), submitted by Committee D-14 on Adhesives. This recommendation is designed to establish certain noncyclic conditions of tests under which the deteriorating effect of moisture and temperature may be determined.

Emergency Alternate

A number of emergency alternates have been approved in line with the procedures established by the Board of Directors at its May meeting. This procedure is established elsewhere in this BULLETIN.

The first emergency alternate provisions approved apply to Specifications for Friction Tape for General Use for Electrical Purpose (D 69–48 T) and for Rubber Insulating Tape (D 119 – 48 T) submitted by Committee D-11 on Rubber and Rubber-Like Materials. The emergency recommendations published on page 35 were submitted since producers were unable to meet present specifications because of the drastic National Production Authority's restrictions which are now in force. The alternate provisions for tentative specifications for Rubber Insulating Tape (D119 – 48 T) states that the tensile strength and elongation of the tape previously rated at 250 psi and 300 per cent, respectively, has been lowered for the emergency alternate provision to read 200 psi and 250 per cent. In the case of alternate provision for tentative specification for Friction Tape For General Use for Electrical Purposes (D 69 – 48 T), Section 8 has been changed. This change pertaining to the number of pinholes for a tape specimen of three consecutive yards selected at random is given below.

Tape—Width, in.	Original No. Pinholes	Emergency Alternate No. Pinholes
¾	6	12
1	8	16
1½	12	24
2	16	32

Schedule of 1952, 1953, and 1954 Meetings

THE 1952 Annual Meeting will commemorate the Society's Fiftieth Anniversary. This meeting, together with the Tenth Exhibit of Testing Apparatus and Related Equipment and Biennial Photographic Exhibit, will be held June 23 in New York City.

The 1952 Committee Week and Spring Meeting is scheduled for Cleveland during the week of March 3.

In 1953 the Society will return to Chalfonte-Haddon Hall, Atlantic City for the Fifty-sixth Annual Meeting, June 22 to 26, inclusive.

The 1953 Committee Week and Spring Meeting will be held in Detroit during the week of March 2.

Chicago has been selected as meeting place for the 1954 Annual Meeting (with Apparatus and Photographic Exhibits) the time being set as June 13–18.

Committee Week and Spring Meeting for 1954 will be in Washington, D. C. during the week of March 1.

Procedure Approved by ASTM for Emergency Specifications and Alternate Provisions

In the interest of expediting procurement or conservation of materials during the National Emergency and at the urgent request of several technical committees in such fields as rubber products, steel, and corrosion-resistant alloys, the Board of Directors, American Society for Testing Materials, at its meeting on May 8, approved a procedure for the issuance of Emergency Specifications and Emergency Alternate Provisions. In most details the mechanics to be followed and the method of issuing will parallel similar procedures used during World War II.

The Emergency Provisions will be on a voluntary basis and used where the purchaser considers the requirements are permissible alternates for the application involved. Action is initiated in a subcommittee of one of the main ASTM groups and must have letter-ballot approval in line with the requirements published in detail below. Secondly, the provisions must be endorsed by the chairman of the main committee or by a two-thirds affirmative vote in the main committee.

The next step is to submit them to the Administrative Committee on Standards with a detailed report and explanations of any negative votes, then prompt publication is contemplated either as a sticker or a sheet, and in addition they will be published in the next issue of the ASTM Bulletin. (A copy of each pink slip may be obtained by members on request.)

To remain in effect, Emergency Provisions and Specifications must be reviewed annually and reaffirmed by letter ballot of the main technical committee.

The Emergency Alternate Provision will be printed on pink stock as was the case during World War II, and from which procedure came the terminology "pink slips" to describe the Emergency Alternates. However, Emergency Specifications, should any develop, and the present thinking is that it may be some time before any of these complete specifications would develop, are to be printed on *yellow* stock.

Federal Government Procedures:

The Federal Government, through the Department for Defense for military specifications and the Federal Specifications Board for nonmilitary specifications, has developed a procedure for handling emergency changes in specifications. In contrast with ASTM "emergency alternate provision," military specifications will be amended in regular form; nonmilitary specifications will likewise be amended by a "conservation amendment," regularly adopted and announced in a "Conservation Action." The Federal Specifications Board will print such conservation amendments on pink paper.

Both FSB and the military have made provision for issuance of emergency specifications printed on yellow paper.

Thus it will be seen that the Government is eliminating the emergency alternate provision feature in effect during the last war, substituting in its place an actual amendment of the specification in question.

There is, of course, a distinct difference between Government specifications which it writes for its own purchases, and ASTM specifications which are for voluntary use by hundreds of producers and consumers. Therefore the ASTM Emergency Procedure seemed very desirable since they will not permanently amend the specifications, but leave a choice.

Procedure for Emergency Alternate Provisions and Emergency Standards

(Adopted by Board of Directors, May 8, 1951)

Emergency Alternate Provisions

1. Emergency Alternate Provisions in ASTM specifications are issued by the Society in the interest of expediting procurement or conservation of materials during the period of National Emergency. They are intended for use where they may be considered by the purchaser of the material as a permissible alternate for the specific application or use desired.

2. An emergency alternate provision shall first have the approval by letter ballot of the appropriate subcommittee of the sponsoring ASTM technical committee. Such approval shall require a two-thirds affirmative vote of the combined number of consumers and general interests voting and a two-thirds affirmative vote of the producers voting, and the results of the ballot shall be classified as to affirmative and negative votes of producers, consumers, and general interests. Secondly, the emergency alternate provision shall then have the endorsement of the chairman of the main committee, or a two-thirds affirmative vote of the main committee by letter ballot in accordance with the provisions of the Regulations Governing Technical Committees, Section 14 (a).

3. When these requirements have been met, the emergency alternate provision shall then be submitted to the Administrative Committee on Standards together with a covering report that (1) describes adequately the conditions which in the opinion of the committee require the adoption of the proposed emergency provision, and (2) gives the reasons for any negative votes that have been cast. If approved by the Administrative Committee on Standards, the emergency alternate provision shall be published with the specification affected either in the form of a sticker or as an accompanying sheet and shall also be published in the next succeeding issue of the ASTM Bulletin. Any emergency alternate provisions approved during the year shall be recorded in the next annual report of the technical committee.

4. All such provisions are subject to annual review, and for them to be continued in effect they shall be reaffirmed by letter ballot of the main committee, in accordance with the provisions of the Regulations Governing Technical Committees, Section 14 (a). The technical committee shall report its recommendation with respect to continuance or otherwise of emergency alternate provisions to the Administrative Committee on Standards.

5. Emergency alternate provisions will be identified by the letters "EA" preceding the serial designation of the specification with which they are issued. The date of issue will be given. If the emergency alternate provision is subsequently revised, lower case letters "a," "b," etc., will be added to the designation and a new date of issue shown.

Example **EAB – 32a** *Example*

Issued January 1, 1952

(Superseding Issue of October 15, 1951)

There will also be printed with each emergency alternate provision the following note:

> "These Emergency Alternate Provisions are issued by the American Society for Testing Materials in accordance with a special procedure in the interest of expediting procurement or conservation of materials during the period of National Emergency. They are intended for use where they may be considered by the purchaser of the material as a permissible alternate for the specific application or use desired."

Emergency alternate provisions will be printed on pink paper.

Emergency Standards

6. Emergency standards are likewise issued by the Society in the interest of expediting procurement or conservation of materials during the period of National Emergency. They may be issued whenever a technical committee finds it appropriate to issue complete new emergency specifications or methods of test rather than emergency alternate provisions. They may be alternates to existing specifications or methods, in which case the existing specifications or methods will be suitably marked to indicate the existence of an alternate.

Actions by the ASTM Administrative Committee on Standards, May, 1951

New Tentatives

Specifications for:

Mineral Wool Batt Insulation (Industrial) (C 262 – 51 T)

Mineral Wool Blanket Insulation (Metal Mesh Covered) (Industrial) (263 – 51 T)

Mineral Wool Felt Insulation (Industrial) (C 264 – 51 T)

Method of Test for:

Determining the Presence of Calcium Sulfate in Hydrated Portland Cement Mortar (C 265 – 51 T)

Compressibility and Recovery of Gasket Materials (D 1147 – 51 T)

Discoloration of Vulcanized Rubber: Organic Finish Coated or Light Colored (D 1148 – 51 T)

Accelerated Ozone Cracking of Vulcanized Rubber (D 1149 – 51 T)

Revision of Tentatives

Specifications for:

Venetian Red (D 767 – 50 T)

Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications (D 735 – 48 T)

Specifications and Methods of:

Test for Sponge and Expanded Cellular Rubber Products (D 1056 – 49 T)

Methods of:

Testing Flat Rubber Belting (D 378 – 50 T)

Testing Rubber Hose (D 380 – 50 T)

Dynamic Testing for Ply Separation and Cracking of Rubber Products (D 430 – 49 T)

Test for Changes in Properties of Rubber and Rubber-Like Materials in Liquids (D 471 – 49 T)

Testing Automotive Hydraulic Brake Hose (D 571 – 48 T)

Testing Asphalt Composition Battery Containers (D 639 – 49 T)

Test for Contact and Migration Stain of Vulcanized Rubber in Contact with Organic Finishes (D 925 – 47 T)

Emergency Alternate Provisions

Specifications for:

Friction Tape for General Use for Electrical Purposes (EAD 69 – 48 T)

Rubber Insulating Tape (EAD 119 – 48 T)

7. The procedures to be followed by the technical committee and the Administrative Committee on Standards in the development and promulgation of such emergency standards shall be the same as those specified for the approval of emergency alternate provisions in Sections 2, 3, and 4 above.

8. Emergency standards will be given an ASTM designation consisting of the letters "ES" followed by a number, beginning with 1 for the first ES, 2 for the second, etc. The date of issue will be given. If the emergency standard is subsequently revised, lower case letters "a," "b," etc., will be added to the designation and a new date of issue shown.

Example *Example*
ASTM Designation: **ES 21b**
Issued July 1, 1952
(Superseding Issue of January 1, 1952)

There will also be printed with each emergency standard the following note:

"Emergency Specifications (Methods) are issued by the American Society for Testing Materials in accordance with a special procedure in the interest of expediting procurement or conservation of materials during the period of National Emergency. They are intended for use where they may be considered by the purchaser of the material as suitable for the specific application or use desired, or as a permissible alternate for existing specifications (methods)."

Emergency standards will be printed on yellow paper.

Important Revision of Specifications for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications

(ASTM D 735–51 T and SAE Standard R10)

THE SAE-ASTM Technical Committee on Automotive Rubber, which is jointly sponsored by the Society of Automotive Engineers and the ASTM, has recently released a 1951 revision of the Specifications for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications.

These specifications were first issued in 1943 and published under the ASTM Designation D 735 and as SAE Standard R10. The specifications were revised in 1946 and 1948. These specifications establish a means of classifying and describing by standard methods the many rubber and synthetic rubber compositions in use in automotive rubber products. While many industrial and mechanical goods applications also may be adequately and conveniently served by the classification system, the committee did not intend that these specifications describe compounds for tires, inner tubes, sponge rubber, hard rubber, or those prepared from latex.

In former versions of these specifications, an attempt was made to segregate natural rubber compounds from those made from GR-S. In the 1951 revision such segregation has been discontinued and rubber and synthetic rubber compositio are divided into two basic types: tho requiring no specific resistance to t action of petroleum-base fluids are iden fied as *Type R;* and those requirin specified degrees of resistance identifi as *Type S*. *Type R* compounds are n further described as to classes of elastome and may be prepared using natural, r claim, or synthetic rubbers, or mixtur thereof as the base, provided the requir ments of the specifications are met. T *Type S* compositions, which are nominal used where resistance to swelling acti by oil is required, are subdivided in three classes:

Class SA compounds having very l volume swell. In practice such co pounds are normally made from pol sulfide-organic dihalide polyme (Thiokol)

Class SB compounds are characte ized as having low volume swell petroleum hydrocarbons and normal describes compounds made from copol mers containing acrylonitrile.

Class SC describes compounds havi medium volume swell in petroleu hydrocarbons. Such compounds a normally made from neoprene as t base material.

The specifications further provide f different grades within each class. T grades are designated by a numbe representing the hardness and tensi strength properties of the stock. addition to combining two classes RN an RS in the New Type R Table resistance change in hardness and tensile streng properties after oven aging has been add as a basic requirement. New values f Suffix "B", compression set, have been e tablished which require for their fulfi ment the development of low-set types compounds. In the Type S Table chan in volume in both high and low anili point oils, change in tensile strengt elongation, and hardness after aging the air oven, and compression set ha been incorporated as basic requiremen Compression set in the new tables und the Suffix "B" requirement has been r duced to require the development of stoc especially compounded to have low com pression set characteristics.

Additional suffix letters are availa and provide a means of specifying r quirements in addition to the basic r quirements and they may be applied sing or in combination in further describi any grade. This provides the consum great versatility in describing the speci requirements for a given rubber product.

While standard numerical limits an test methods have not yet been establish for all the requirements denoted by suff letters, it is the committee's intention provide such information at the earlie opportunity. Further work of the com mittee will be directed toward even great simplification of the specification, whi should result in making it even easier f the engineer to use.

A practical addition to the revis specifications is a Key Chart with e amples illustrating the use of the specific tions in selecting a particular type, clas or grade.

It is the hope of the SAE-ASTM Tech- cal Committee on Automotive Rubber at these specifications be used not only purchasers of rubber parts for auto- otive use but by all industries who ecify their rubber requirements in terms physical properties.

Separate copies of these revised specifications, including a copy of the insert Key Chart, can be procured from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa., at 40 cents each. Separates of the Key Chart are 10 cents each.

ational Bureau of Standards and British Standards Institution Felicitated

On May 8, 1951, the Board Directors adopted two resolutions which ere congratulational messages to the ational Bureau of Standards and the itish Standards Institution on their th anniversary. The exact text of these solutions is given below.

RESOLUTION
Adopted by the
BOARD OF DIRECTORS
at Its Meeting
May 8, 1951, at Philadelphia, Pa.

Whereas, the National ureau of Standards in completing a half ntury of significant achievement has, rough its fruitful research, made invalu- ble contributions to the advancement of ience; to the development of standards; the promotion of public welfare; and rther, has established in an effective ay the confidence of the public and of dustry in its integrity and findings; and

Whereas, the National Bureau of andards in a most cordial relationship s cooperated over the years with the nerican Society for Testing Materials rough participation in the work of its chnical Committees in developing andard tests and specifications for ma- rials, and through presentation before e Society of the results of Bureau re- arches in the field of Materials; now, erefore, be it

Resolved, by the Board of Directors of e American Society for Testing Ma- rials, for and in behalf of the Society, at it extend to the National Bureau of andards, on the significant occasion of is Semi-Centennial, congratulations and st wishes together with sincere hopes r continued success in the future in the complishment of scientific achieve- ents that are in the best interests of merican science, industry, and the public.

RESOLUTION
Adopted by the
BOARD OF DIRECTORS
at Its Meeting
May 8, 1951, at Philadelphia, Pa.

Whereas, the British Stand- ds Institution is this year rounding out ty years of splendid accomplishments in e development of standards of inestima- e value in the advancement of industry d trade, and

Whereas, cordial cooperative relations ve existed over the years between the ritish Standards Institution and the merican Society for Testing Materials the exchange of information and ideas ith respect to standardization prob- ms of mutual interest, which coopera- on is deeply appreciated; now, therefore, it

Resolved, by the Board of Directors of the American Society for Testing Materials, for and in behalf of the Society, that it extend to the British Standards Institution, on the significant occasion of this Semicentennial, congratulations and best wishes for continued success in the future.

Building Fasteners Covered by ASTM Specifications

The 660,000 rivets used in the construction of the 41-story Headquarters Building of U. S. Steel Corp. were covered by ASTM Tentative Specification A 141 "Structural Rivet Steel." The total weight of rivets and bolts was over 500 tons. The building itself is a simple slab structure with the utilities, rest rooms, and elevators located in the central service core. It is 144 ft wide and 220 ft long. The structure required 120,000 tons of building materials, 15,000 tons of which was for steel used in the frame construction. The foundation, designed to support a load of 20 tons per sq ft, penetrates 85 ft below street level.

Interesting Sidelights on the Meeting

Perhaps there is no better way to start these informal notes than to take you with us at 7:45 a.m., Friday, June 22, the only really foggy day at Atlantic City (the full week up to that time had been beautifully clear) when, chatting with Messrs. Harlan Depew and Si Collier, we saw a gray-haired, rather gaunt figure pop out from under the boardwalk with a swimming robe and start toward the ocean. What a surprise to recognize Frank N. Speller, 76 years old, who about 18 to 20 months ago was hospitalized with broken legs and hip as a result of a fall through a ship hatch when he was on an inspection job. He didn't hesitate a bit though he was the only swimmer on the beach, but waded right in and jumped into a good big breaker. Some of our long-time members are really hardy fellows! An Honorary Member of the Society, Mr. Speller has served continuously on Committee A-1 on Steel since 1905, and on other technical committees.

The officers of Committee A-2 on Wrought Iron, at their luncheon meeting when discussing committee problems, were pleased to have Dr. James Aston join them. Inventor of the Aston process, he has served on this committee for many years, and was Secretary 1944–1950. Dr. Aston is a mere 75.

Dr. G. H. Clamer, Past-President and Honorary Member, may not have attended more annual meetings of the Society than anyone else present this year but we haven't heard of anyone who has exceeded his record of 49 annual meetings. This year we were glad to have Mrs. Clamer with him.

Two members were serenaded at the meeting for their birthdays, E. J. Albert, Chairman of the Dinner Committee, at the dinner on Wednesday, June 20, and R. E. Hess, Assistant Executive Secretary, in the Haddon Hall dining room on Friday, June 22. Using golfers' language Mr. Albert is in the high 60's and Mr. Hess in the moderately low 50's.

Then there was the change not only of a room assignment for a meeting, but postponement of an hour, and under a handicap of publicizing last-minute changes three of our members just sat in the old room at the old time waiting patiently. With over 600 meetings some changes are presumably unavoidable, but should be kept to a minimum. Fortunately our committee officers realize the awkwardness of too many last-minute shifts.

ASTM Bulletin

JULY 1951

NO. 175

NINETEEN-SIXTEEN
RACE STREET
PHILADELPHIA 3, PENNA.

Membership Exceeds 7000

Steady Membership Growth Indicates Expanding Interest in Society's Work

On June 1, 1951, the membership of the Society passed the 7000 mark. The statistics as detailed in the 1951 Annual Report of the Board of Directors showed that of this number there were 236 sustaining members, 1704 companies and firms, etc., and 5061 individuals and juniors.

The steady growth in membership in the past few years has been gratifying to the Society officers, not only because it has aided in insuring a sound financial program, particularly because of the encouraging number of organizations which are sustaining and company members, but especially viewed from the point that a larger membership is indicative of expanding interest in the Society's activities. A greater membership means a larger potential use of ASTM standards, which in turn means more benefits coming from the intensive work of our committee men, and it also means that the fruits of the important research will be enjoyed in a wider circle.

Mere statistics are not too interesting, and furthermore a comparison of the membership now with some years back would entail an evaluation of the significance of individual, company, and sustaining membership, etc. Nevertheless, following the depression years it took more than a decade for the membership to recover the losses sustained in that period. On January 1, 1931, the membership was 4327, and ten years later it was just 4470. From then on a steady growth ensued, and in 1944 the membership passed the 5000 mark; in 1946 it exceeded 6000, and the growth is continuing.

Membership Intangibles

The tangible benefits from ASTM membership including receipt of the extensive publications—*Proceedings*, Books of Standards, ASTM Bulletin—and the privilege of requesting preprinted reports and papers just prior to the annual meeting each year, are considered important. The other services that are offered also mark membership in ASTM as worth while. However, in evaluating Society affiliation one should not overlook the significant fact that every member and every committee member is supporting in an important way a unique institution which elects to use the democratic processes in achieving its ends. And in this day and age, that is important.

The cooperative work of our members is the underlying basis for the Society's accomplishments, and these in turn are fundamental in procuring new members.

Stalin's Secret Weapon?

This question captions a pertinent editorial by Walter J. Murphy in the June 11 issue of *Chemical and Engineering News*. It concerns a most important matter, the man-power shortage of scientists and technologists.

Though the ASTM Bulletin, and the Society, has concentrated on technical as distinct from professional matters, nevertheless we would feel somewhat remiss if we did not note the extreme seriousness of the shortage scientifically trained personnel which coming upon us all too soon, and wh may be critical in the next few years

Dr. Murphy first notes that proba shortages are due largely to (1) fe students enrolled in engineering cour and (2) the expanded military progra One of the best-informed individu M. H. Trytten, National Resea Council, has estimated the number B.S. degrees in the physical sciences be less than 30,000 in 1954. T compares with 75,000 in 1950.

The ominous picture on engineer startling. The U. S. Office of Edu tion states that, compared with 52,000 engineering graduates in 19 the 1955 guesstimated figure is 17,0 President Killian, of MIT, notes t *this* June there has been a deficit about 11,000 engineers.

Obviously there are various answ why this situation comes to pass. Murphy asserts that professional cieties certainly have a major resp sibility, but that it must be sha by industry, and he notes the nificant advertisement of one le ing industrial organization as way to cooperate. This advertisem stresses to parents, teachers, and you people the need for trained scienti

Question of financial incentive, mental and spiritual satisfaction w an engineering or scientific job, challenge offered the young man woman, the purported narrowness engineering training as contrasted, example, with the liberal arts c riculum, the influence of parents, other factors merit continuing stu We simply note this extremely seri situation which indeed can have portant repercussions on our work the field of materials, and suggest t our members keep constantly in m the need for whatever construct actions can be taken.

Schedule of ASTM Meetings

Date	Group	Place
September 13	Committee C-8 on Refractories	Bedford Springs, Pa.
September 17–18	Board of Directors Meeting	Philadelphia, Pa.
September 27–28	Committee C-22 on Porcelain Enamel	Milwaukee, Wis.
October 4–5	Committee D-10 on Shipping Containers	Cleveland, Ohio
October 7–11	Committee D-2 on Petroleum Products and Lubricants	Chicago, Ill.
October 8 or 9	New England District	Boston, Mass.
October 10	Ohio Valley District	Louisville, Ky.
October 15–17	Committee D-13 on Textile Materials	New York, N. Y.
October 24–26	Committee C-1 on Cement, and Committee C-9 on Concrete	Lafayette, Ind.
October 25–26	Committee D-15 on Engine Anti-Freezes	Atlantic City, N. J.
October 26	New York District	New York, N. Y.
October 31	Northern California District	San Francisco, Calif.
October 31	Drexel Institute Exercises	Philadelphia, Pa.
November 1	St. Louis District	St. Louis Mo.
November 2	Philadelphia District	Bethlehem–Allentown, Pa.
November 8	Southern California District	Los Angeles, Calif.

DISTRICT ACTIVITIES

istrict Officers and Personnel

THE District Councils of e Society have conducted an election councilors for the ensuing term of o years, under the ASTM Charter r Districts, which has been in effect ice January 1, 1947. This charter ovides that councilors and officers all be elected by the ASTM mem- rs and committee members in the spective districts. Ballots were dis- ibuted in May, and all councilors ted on the ballots on recommenda- n of the respective Nominating mmittees were elected.

The list of new and reelected coun- ors is given below. Newly elected uncilors are indicated by an asterisk). Terms of approximately one lf of the councilors expire each June. (The names of District Officers— hairmen, Vice-Chairmen, and Secre- ries—are given in the 1950 Year ook, and will be shown again in the forepart of the new 1951 Year Book when it is issued in the early Fall.)

Several of the districts have already planned Fall meetings, and members are urged to watch ensuing BULLETINS for specific dates and topics of meetings to be sponsored.

As soon as possible after meeting details are definite, each member and committee member in the specific area receives a direct-mail notice, and usually other groups of technical men in this area concerned with the subject under discussion are also invited.

A complete list of district councilors will appear in the 1951 Year Book. Many of the councilors' terms carry through 1952, and the list below notes *only newly elected councilors and re-elections of those whose terms expired in* 1951.

List of New or Re-elected District Councilors as of June, 1951

ouncilors and officers whose terms carry through 1952 are not included in this list. r a complete list, see 1951 Year Book now in preparation.)

Chicago

Councilors: L. H. Amrine, Imperial olded Products Corp.; W. L. Bowler, he Pure Oil Co.; J. F. Calef, Automatic lectric Co.; D. L. Colwell, Apex Smelt- g Co.; F. A. Faville, Faville-LeVally orp.; H. P. Hagedorn, City of Chicago, ureau of Engineers; C. H. Jackman, nited States Steel Co.; A. M. Johnsen, he Pullman Co.

Cleveland

Councilors: H. D. Churchill, Case stitute of Technology; A. H. DuRose,* he Harshaw Chemical Co.; G. W. lanagan, B. F. Goodrich Chemical Co.; . C. Jenner,* Reliance Electric & ngineering Co.; R. B. Textor, The extor Laboratories; J. C. Weaver,* he Sherwin-Williams Co.

Detroit

Councilors: T. A. Boyd, General otors Corp.; C. A. Daymude,* City Detroit; F. J. De Witt,* Parker Rust- roof Co.; Douglas Dow,* The Detroit esting Laboratory; C. J. Line,* Peerless ement Corp.; E. L. Morrison,* The udd Co.; Robert Sergeson, Rotary lectric Steel Co.; C. E. Topping, Con- mers Power Co.; A. D. Wagner,* udson Motor Car Co.; H. A. Wagner, he Detroit Edison Co.; J. L. Williams,* he Dow Chemical Co.

New England

Councilors: Thomas Berrigan,* MDC Sewerage Division, Boston; R. W Chadbourn, Boston Edison Co.; W. D. Clement,* University of New Hampshire; R. H. Doughty, Fitchburg Paper Co.; H. D. Evans,* Pepperell Mfg. Co.; A. A. Klein, Norton Co.; F. E. Richart, Jr.,* Harvard University; D. C. Scott, Jr., Scott Testers, Inc.; A. L. Shields, Westinghouse Electric Co.; Prof. W. C. Voss, Massachusetts Inst. of Technology; R. W. Woodward,* Underwood Corp.

New York

Councilors: M. B. Chittick, American Mineral Spirits Co.; G. J. Comstock, Stevens Institute of Technology; Hugh Craig, Oil, Paint and Drug Reporter; J. G. Detwiler, The Texas Co.; S. R. Doner, Raybestos-Manhattan, Inc., Manhattan Rubber Div.; Benjamin Grodman, Central Testing Lab.; C. A. Hescheles, United States Rubber Co.; P. S. Kingsley, General Electric Co.; W. J. Krefeld, Columbia University; G. K. Lake, Pepperell Mfg. Co.; S. Skowronski, International Smelting & Refining Co.; C. R. Stock, American Cyanamid Co.; T. S. Taylor, United States Testing Co., Inc.; R. H. Titley, Public Service Electric & Gas Co.; L. T. Work, Consulting Engineer.

Northern California

Councilors: R. M. Baird,† National Lead Co.; R. A. Chisholm, Corps of Engineers, South Pacific Materials Lab.; T. K. Cleveland, Phila. Quartz Co. of Calif., Ltd.; R. N. Conner, Baldwin-Lima-Hamilton Corp.; R. E. Davis, University of California; R. B. Freeman, Columbia Steel Co.; J. J. Gould, Consulting Structural Engineer; R. A. Kinzie, Santa Cruz Portland Cement Co.; W. N. Linblad,† Pacific Gas and Electric Co.; P. E. McCoy, American Bitumuls Co., O. McIntyre,† Schlage Lock Co.; L. Mittleman, Tide Water Associated Oil Co.; W. W. Moore, Dames & Moore; G. H. Raitt, Consulting Engineer; H. A. Williams, Stanford University.

Ohio Valley

Councilors: R. S. Armstrong,* Standard Oil Co.; D. S. Bruce,* Gummed Products Co.; R. G. Chollar,* National Cash Register Co.; F. M. Crapo, Indiana Steel & Wire Co.; B. W. Gonser,* Battelle Memorial Institute; T. W. Guy, Consulting Engineer; Archibald Hurtgen, Henry Vogt Machine Co.; Walter Klayer,* Aluminum Industries; D. E. Krause,* Gray Iron Institute; E. E. McSweeney,* Battelle Memorial Institute; W. B. Wendt, University of Louisville.

Philadelphia

Councilors: L. D. Betz, W. H. and L. D. Betz; W. C. Clements, Bethlehem Steel Co., Inc.; Henry Freynik,* Riverside Metal Co.; Charles Haydock,* Consulting Engineer; L. B. Jones,* Consulting Engineer; F. B. Lysle,* Retired; J. J. Moran, Kimble Glass Div., Owens-Illinois Glass Co.; L. F. Rahm, Princeton University; Percival Theel, Philadelphia Textile Institute.

Pittsburgh

Councilors: F. H. Allison, Jr.,* United Engineering & Foundry Co.; Hugh Beeghley,* Jones & Laughlin Steel Co.; A. R. Ellis, Pittsburgh Testing Laboratory; F. M. Howell,* Aluminum Co. of America; A. L. Johnson,* Universal-Rundle Corp.; Geo. H. Knode,* Pennsylvania Railroad Co.; P. G. McVetty, Westinghouse Electric Corp.; E. R. Queer,* Pennsylvania State College; H. R. Redington, National Tube Co.; F. N. Speller, Metallurgical Consultant; E. B. Story, A. M. Byers Co.; L. W. Vollmer, Gulf Research & Development Co.

St. Louis

Councilors: E. P. Buxton, Western Cartridge Co., Division of Olin Industries;

D. S. Eppelsheimer, Missouri School of Mines and Metallurgy; P. G. Herold, Missouri State Mining Experimental Station; W. W. Horner, Horner and Shiffrin; R. W. Notvest, American Brake Shoe Co.; F. V. Reagel, Missouri State Highway Department; E. E. Scholer,* Shell Oil Co., Inc.; A. C. Weber, Laclede Steel Co.; F. G. White, Granite City Steel Co.

Southern California

Councilors: Russell E. Arnold,* Pacific Clay Products; Fred Behrens,* Wilshire Oil Co., Inc.; H. W. Bolin,* State Dept. of Public Works; W. O. Brandt,* Gladding McBean Co.; Guy Corfield,* Southern California Gas Co.; Bert Folda,* General Petroleum Corp.; E. F. Green Axelson Manufacturing Co.; J. D. Herbert,* Blue Diamond Corp.; C. E. P. Jeffreys,* Truesdail Laboratories; J. B. Morey, The International Nickel Co., Inc.; R. E. Paine, Aluminum Co. of America; L. Schapiro,* Douglas Aircraft Co., Inc.; D. M. Wilson,* University of Southern California.

Washington, D. C.

Councilors: E. W. Bauman,* National Slag Association; F. A. Biberstein,* The Catholic University of America; Art Brown,* The Arundel Corp.; L. S. Crane,* Southern Railway System; P. N. Gardner,* Henry A. Gardner Laboratory; P. L. Rogers,* Riverton Lime & Stone Co., Inc.; W. R. Von Blon,* Veterans Administration, Construction Service; J. W. Whittemore,* Virginia Polytechnic Institute; D. O. Woolf,* Dept. of Commerce, Bureau of Pu[illegible] Roads.

Western New York-Ontario

Councilors: J. G. Augenstein, [illegible] Rubber Reclaiming Co.; W. H. L[illegible] Pratt & Lambert, Inc.; G. S. Mall[illegible] Anaconda American Brass, Ltd.; [illegible] Mermagen, University of Rochester; [illegible] Metcalf,* Burlington Steel Co., L[illegible] Charles Miserentino, Dunlop Tire [illegible] Rubber Corp.; A. A. Moline, Canad[illegible] Westinghouse Co., Ltd.; F. C. Ruth[illegible]ford, Lightning Fastener Co., Ltd.; [illegible] L. Suter, National Aniline Div., Al[illegible] Chemical & Dye Corp.; R. D. Thomps[illegible] Taylor Instrument Co.; G. H. von Fu[illegible] Consultant.

* Indicates newly elected councilors.
† Appointed to fill an unexpired term.

Intense Interest in Synthetic Fibers Shown at New York District Meeting

Four Speakers Describe New Synthetic Fibers

ONE of the best district meetings of the year, with an excellent attendance, took place under the auspices of the New York District on Friday, April 20, 1951, at the New York Engineering Societies Building.

The Council had expressed a strong desire to have leading technical authorities give latest information and data on "Synthetic Fibers and What They Mean to Us." The Program Committee, headed by G. K. Lake, Pepperell Manufacturing Co., devoted much time and effort to procure outstanding men, and the success of the meeting reflects the fine planning, and the close cooperation of the authors. Mr. Lake enlisted the efforts of C. W. Bendigo, American Cyanamid Co., for a number of years Chief Editor of *Textile World.*

Several members of the New York District Council cooperated in the meeting. The officers, Messrs. H. C. R. Carlson, G. O. Hiers, S. R. Doner, and A. A. Jones, carried out various assignments. E. A. Snyder arranged for the dinner at which the authors were guests, and publicity was handled efficiently, as it has been for recent meetings, by Hugh Craig, Editor of *Oil, Paint and Drug Reporter.*

Because of the great interest in synthetic fibers, abstracts noting the more salient features of the papers appear below.

Program and Abstracts

Introduction—Synthetic Fibers, C. W. Bendigo, American Cyanamid Co., New York, N. Y.

"Dacron Polyester Fiber" (formerly Fiber "V") and Orlon Acrylic Fiber, Joseph B. Quig, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

"Dynel—Its Characteristics and Uses," Carl A. Setterstrom, Union Carbide and Carbon Corp., New York, N. Y.

"Dyeing and Finishing Synthetic Fibers," Arthur W. Etchells, Hellwig Dyeing Corp., Philadelphia, Pa.

Introduction—Synthetic Fibers

Mr. C. W. Bendigo opened the meeting with a general statement on the significance synthetic fibers have in today's commercial use. He pointed out that, of all the fibers utilized today, cotton still retains its first place with an annual consumption of about 4.75 billion pounds, followed by synthetic fibers, of which there are a dozen distinctly different varieties, with 1⅓ billion pounds, wool being third at ⅔ billion pounds.

Concentrating his introductory remarks on synthetic fibers, Mr. Bendigo showed that viscose, acetate, and cupra rayons account for 94 per cent of the total U. S. synthetic fiber production. Viscose yarns have been the most popular, since they are cheaper to produce than cotton even if the retail price is often higher. Much of the continuous-filament type viscose rayon is used in clothing and house furnishing, but 25 per cent of its total production finds its application in tire cord.

The much-publicized nylon of which there are four specific kinds, (1) regular multifilament, (2) monofilament, (3) high tenacity, and (4) staple, is a poor cousin to rayon as far as production is concerned. Nylon is still produced in quantities less than 100 million pounds per year, but this should rapidly increase.

The acrylic fibers are relatively the fastest growing and probably will crowd nylon out of second place in the next decade. Dynel, a nonburn[illegible] staple made of 40 per cent acrylonit[illegible] and 60 per cent vinyl chloride; Orlo[illegible] continuous acrylic filament, and Acril[illegible] a silk-like staple made principally f[illegible] acrylonitrile are being used alone o[illegible] blends with wool. They excel woo[illegible] strength, wear, and launderabil[illegible] However, with the exception of Dy[illegible] they burn readily and are more diffic[illegible] to dye.

The Azlons are protein wool-[illegible] fibers of which the only one used to[illegible] for textiles is Vicara. It is a weak, [illegible] fiber primarily blended with ordin[illegible] wools or other fibers to impart a ca[illegible]mere-like hand.

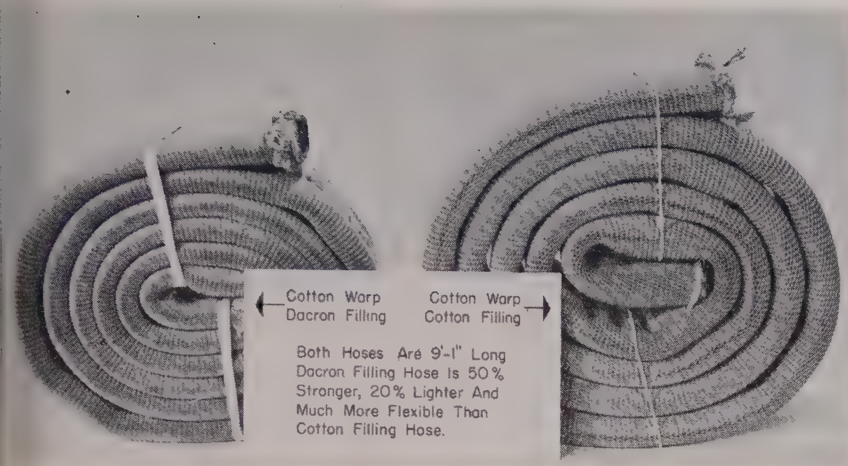
Glass fibers for textile use, Fiber[illegible] and Vitron, are currently used largely [illegible] the military and in industrial appl[illegible]tions. Glass fibers have some rem[illegible]able properties, but their bending [illegible] efficient is rather low, being limited [illegible] per cent before breaking occurs, mak[illegible] knotting impossible.

Monofilaments or wire-like tex[illegible] fibers appear in several types. M[illegible] important are those using vinyl-id[illegible] chloride, such as Saran and Ve[illegible] Monofilament fibers are used in [illegible] holstery, screens, and novelty fabrics.

Dacron, the newest of the comm[illegible]cially significant fibers, has proper[illegible] close to nylon and the acrylics. [illegible] staple form is wool-like, but it does [illegible] weather as well as acrylics.

"Dacron Polyester Fiber" and Or[illegible] Acrylic Fiber

Starting out with Orlon, Mr. J[illegible] Quig stated that its most import[illegible] characteristic is its excellent resista[illegible] to degradation by chemicals—part[illegible]larly acid—and to degradation by s[illegible] light and weathering. Some delus[illegible]



nts which catalyze the photo-degradaion of many other fibers and often conribute to the fading of many dyes, not nly fail to influence Orlon but generally o not catalyze the fading of dyes in the ʼrlon fiber. Orlon filament yarn posesses a warm, dry, silk-like hand, a subued luster, excellent recovery from rinkling, and dimensional stability in oth the dry and moist states.

Dacron polyester is excellent in regard o its dry hand and its high resistance o stretching, combined with a high ensile strength. The tensile strength f Dacron filament is higher than that f silk or linen. Incorporation of the enzene ring in the long-chain molecule as given fewer points of rotation, herefore producing stiffness, which auses Dacron to resist bending and romotes speedy recovery from bending. ts crispness, high resistance to stretch, igh elastic recovery and insensitivity o humidity make Dacron filament exremely suitable as sewing thread for earing apparel (it will not pucker in the ıbric), certain V-belts which cannot be djusted easily, and as cover for highressure fire hose.

The flammability of Orlon acrylic ber is approximately that of cotton, cetate rayon, and viscose rayon fabrics f similar weight and weave. Orlon has somewhat higher ignition temperature han cotton and rayons. Dacron polyster fibers are similar in their flammaility characteristics to nylon fabrics. Jndyed, finish-free fabrics will melt at pproximately 480 F., will burn slowly, ut will not flash burn.

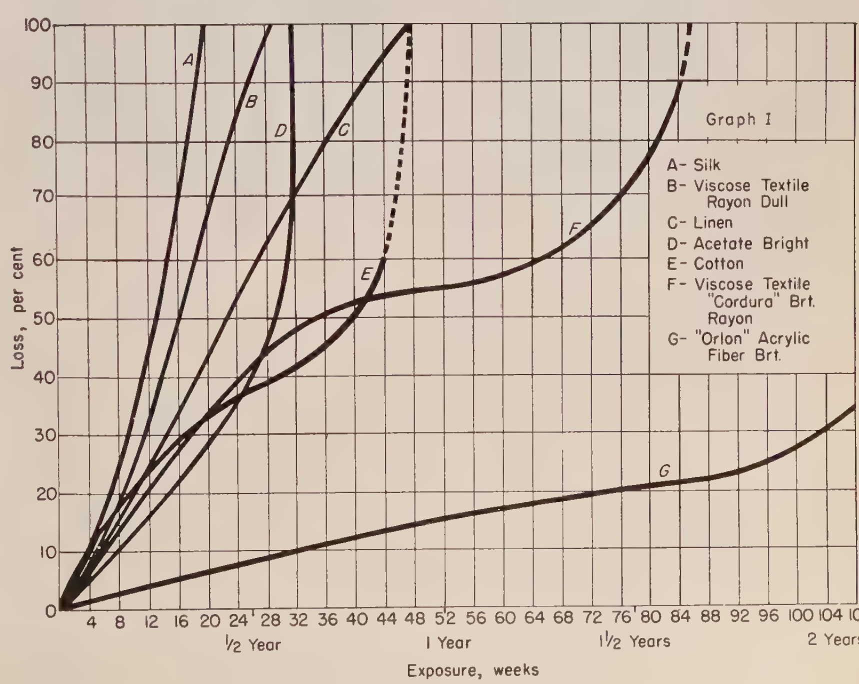
The most important present applicaion of Orlon and Dacron fibers is as ynthetic staple used with other maerials. For many years the problem of natching the feel and resilience of wool roved a difficult problem. It was hought that in order to solve this probem it would be necessary to duplicate he chemical properties of wool in order o match its feel and resilience. But it as been proved that duplication of chemical properties is not necessary as long as the mechanical properties coincide with those of wool fibers.

The addition of Orlon and Dacron staples to other fabrics will confer "extras" to these materials, such as greater wear life, outstanding wrinkle and abrasion resistance, and retention of shape under dry and wet conditions. Outerwear made of Orlon or Dacron will require less frequent pressings, whether they be worn under dry, humid, or rainy conditions. Instability of dimensions and puckering of lightweight suiting fabrics in humid weather can be eliminated by using these new fibers alone or incorporating them in blends with other fibers.

Dyeing and Finishing Synthetic Fibers:

This discussion on synthetic fibers was followed by a talk on "Dyeing and Finishing Synthetic Fibers," given by A. W. Echells, The Hellwig Dyeing Corp. This subject is rather important since the introduction of new synthetic fibers, as for instance viscose rayon and cellulose acetate, presents new problems to the dyer and finisher. One of the problems encountered is the dirt carried by synthetic fibers. The new fibers have an affinity for soil of all kinds, and ordinary scouring methods can hardly remove this dirt. These synthetic fibers contain more soil than older types of fibers. This is caused by production machinery, which perhaps was considered clean enough for the old fibers, but is not for the newer fibers. Through its electrical characteristics, the new fibers also seem to attract and tend to hold soil to a greater extent than old fibers.

In connection with the dyeing and finishing, heat setting of the new fibers was discussed. While this will confer some valuable properties such as improved hand, more wrinkle-resistance, and dimensional stability and also gives the fabric a more uniform appearance, it will not make an inherently poor fabric salable as first-class merchandise. Heat setting can only be done on absolute soil-free and clean fabric since it might polymerize and fix dirt to the fiber, making it impossible to remove it afterward. The actual process consists of treating nylon at a temperature at over 400 F. but under 450 F. for about 10 seconds. Dacron when exposed to temperature of 350 F. to 370 F. is improved in appearance, having a more finished look and also some of the faults developed in weaving are overcome, but as this fiber is normally wrinkle-resistant, little or no improvement is shown in



Effect of Outdoor Exposure on Yarn Tenacity

this property by heat setting. Orlon heat set at 460 F. for one minute is stabilized against shrinkage.

The newer synthetic fibers have one property in common—they are all hydrophobic and do not swell when wet with water. This property is not a desired one since the dyer depends on the swelling characteristics of fabrics to get the dyestuffs onto the fiber. Another feature which often proves to be an annoyance is that these fibers outlast the dyestuffs, so that in many cases the color is destroyed long before the useful life of the fiber is gone.

There are various methods available to dye the different synthetic fibers. Nylon is generally dyed with acetate or dispersed dyes. While these colors are insoluble in water, they can with a dispersing agent be suspended in water as fine particles, and in such a form are adsorbed by the nylon and gradually go into solution in the nylon substance, so that we have a suspension of a solid in a solid. Another class of dyes—the acid or wool dyes—have an affinity for nylon, for nylon does have a few dye acceptance groups or sites to which the dye molecule may be attached, but the number is small, compared to wool.

Dacron can be dyed with the dispersed or acetate dyes to give good wash fastness. The color should be applied in the presence of swelling agents or dye carriers, such as benzoic or salicyclic acids in order to prevent the formation of pastel shades. There is some objection to carrier dyeing, because the dye assistants are difficult to remove. Also the waste from the dyeing process is considered an objectional pollutant.

Orlon can be colored by several methods, none of which is satisfactory from the application standpoint or that of fastness.

Dynel can also be dyed with dispersed or acetate dyes. Another method is the use of acid dyes and a copper salt which acts as a binder between the acid dyestuff and the fiber. Swelling agents such as *p*-phenyl-phenol may also be used to develop deeper shades.

The finishing of the new synthetic fibers has not been as great a problem as that of coloring because most of them have naturally physical properties which had to be obtained by chemical or mechanical means on the older fibers; they are resilient and show but little tendency to crease and, therefore, require no resin treatment. These synthetic fabrics can be treated with water repellants and spot-resistant compounds. The fabrics can be made softer with various softeners or can be made firmer by the use of resins. One property which is disadvantageous is the large amount of static which these fibers accumulate; if rubbed or exposed to friction, they will develop sparks.

Since these new fibers have so many good properties, it is further desired to increase its already good flame resistance. All experiments so far carried out in regard to flame resistance produced the opposite effect upon the application of fire-resistive coatings to the fabrics.

Dynel—Its Characteristics and Uses:

As a final talk delivered by C. A. Setterstrom, Carbide and Carbon Chemical Co., on "New Synthetic Fibers—What They Mean to Us, and Some Properties of Dynel," it was pointed out that only 10 per cent of the total poundage of textile fibers sold in 1951 will be wool, but wool will account for 30 per cent of the dollar volume. Therefore it is quite apparent why research efforts in the chemical industry have been directed at finding a fiber which can be used to supplement the supply of wool. It is already clear that the new synthetic fibers will give wool stiff competition. By the use of 30 to 40 per cent of Dynel, it will be possible to obtain a Dynel-wool jersey blend that is washable, shrink resistant, and which retains a crease even when wet.

It is estimated that in the case of a large-scale war or even long-continued military mobilization, military requirements and essential apparel uses for wool will require between 70 million and 352 million pounds per year more than will be available to the United States. Alternate fibers will take care of approximately 110 million pounds per year of this deficit. Dynel is presently under consideration, and tests by various military agencies for a number of diversified uses are being carried out. It is considered for use in blankets, pile fabrics for Parka liners, underwear in blends with cotton, serge in blends with wool, camouflage nets, tent liners, mittens, and mufflers. The only actual application at the present time is as knit pile fabric for the backing of Arctic mittens.

The industrial application of Dynel is enormous. It has found application for industrial clothing because of its high chemical resistance and its high wet strength. Another proved use is as a paint brush roller which has a knitted Dynel pile fabric covering, or as an iron exchange resin bag wherein the used salts are washed out by acid solutions. Still another application of Dynel for filter fabrics is worth mentioning.

Just as Dynel finds enormous application in industry, its use for household articles is unlimited. Blankets, drapery and upholstery fabrics, etc., are just a few items where Dynel will be extremely applicable.

Men's half hose of Dynel have m[...] with good trade and consumer acce[...] ance. Its easy washability, shrink [...] sistance, permanent elasticity and sha[...] retention, softness, sturdiness, warm[...] mothproofness, and mildewproofness [...] some of its desired properties. Th[...] and many more advantages are found [...] pile fabrics Dynel, in tricot and circu[...] knit fabrics Dynel. In suiting ble[...] with either acetate, viscose, wool a[...] cotton, Dynel provides more wrin[...] resistance, a pleasant hand, shr[...] resistance, and crease retention.

In closing Mr. Setterstrom stated t[...] progress will certainly continue to [...] made in the synthetic fiber field, [...] perhaps more progress will be made [...] the relationship of fabric-to-fiber char[...] teristics. By drawing on a great div[...] sity of aliphatic and aromatic monom[...] and by utilizing new polymerizat[...] techniques, the industry will be able [...] build into the fiber almost any si[...] desirable property. The difficulty [...] that usually the one particular prope[...] can be attained only at the sacrifice [...] some other property. The solution [...] this answer will be a balancing of all [...] characteristics of synthetic fibers.

Districts Planning Fall a[...] Winter Meetings

Several of the AS[...] District Councils already have pl[...] for Fall and Winter meetings and ot[...] activities, and other Councils plan [...] appoint Program Committees. Pr[...] dent Truman S. Fuller has been inv[...] by a number of the Districts to spe[...] and so will be in New York on Fri[...] Oct. 26, and in Bethlehem for a j[...] meeting to be sponsored by the Ph[...] delphia District early in Novem[...] The Ohio Valley District is plannin[...] joint meeting in Louisville, on [...] 10, at which the President will [...] speak.

F. L. LaQue, International Ni[...] Co., Inc., the 1951 Edgar Marb[...] Lecturer, who gave a most interes[...] address on Corrosion Testing, [...] accepted an invitation to use this a[...] basis for technical talks at Meet[...] in San Francisco and Los Ange[...] under the auspices of the respec[...] ASTM Districts. He will speak [...] San Francisco on Oct. 31, and [...] Los Angeles on Nov. 8.

Further details of these meetings [...] be published in the Bulletin [...] members and committee members [...] the respective districts will rec[...] well in advance direct mail notice[...] each meeting.

Not only ASTM members and c[...] mittee members, but everyone intere[...] in the subjects to be covered is welc[...]

etroit District Meeting on High Temperature Metals

TWO-HUNDRED fifty mem-
rs and guests attended the dinner
ich preceded the meeting of the
etroit District on May 3, at the
kham Memorial Building. Presi-
nt L. J. Markwardt addressed the
nner meeting and presented an ex-
llent outline and summary of ASTM
tivities throughout the country. The
tual technical session which was at-
nded by 350 members and guests was
ghlighted by a paper "High Temper-
ure Metals," presented by Dr. A.
White, Director of the Engineering
esearch Institute, University of Michi-
n and a Past-President of the Society.

Dr. White was introduced by Paul W. Thompson, Vice-President of the Detroit Edison Co., who for many years has worked closely with Dr. White in developing special metals required in the power industry.

The paper covered in detail chronologically the development work on the effect of high temperatures on metals under constant stress. This pioneering work was carried out at the University of Michigan, sponsored by the Detroit Edison Co. The early work on high-temperature properties of metals, which is of much importance to the power-generating industry, formed a good background for Dr. White's final comment on recent research work at the University of Michigan. A brief outline was included on the properties and problems of special alloys which are so important in the construction of gas turbines and jet engines.

A special feature of the dinner was the presence of all of the past chairmen of the Detroit District who are residing in the Detroit area. District Chairman W. R. Fraser presided at the meeting. The arrangements for the meeting were very ably handled by the following: C. H. Fellows, D. M. McCutcheon, F. P. Zimmerli, C. M. Gambrill, D. J. McKinnon, C. E. Topping, and H. A. Wagner.

"Balancing the Economy for Defense Production"[1]

By Nathaniel Knowles, Deputy Administrator, Defense Production Administration

EDITORS NOTE.—Believing that many
the members not at the Annual Meeting
uld find of much interest the address
esented by Mr. Knowles as a special
ature of the meeting on Wednesday
orning, June 20, a somewhat condensed
rsion of his address follows.

oblem Facing Nation

Never have we been confronted with a
allenge quite as difficult as that which
nfronts us today. It is a wavering chal-
ge, sometimes taking the form of
lence, at other times of subversive ef-
rts to weaken our own position right
re at home. Confusion can be expected
der such conditions. We would like to
rget wars and international tension, but
ere can be no solid prosperity for any of
under the present threats.

For the first time in our history, we are
gaged in an effort to rebuild our military
ength without a clear idea of how a
reatened "showdown" attack might be-
. We can no longer count on the
shions of time and space. Our Allies,
w much stronger thanks to their courage
d our helping them to help themselves,
still affected economically and psy-
ologically by World War II. We have
Pearl Harbor to galvanize us and sweep
ay doubts and confusion. But the
allenge is as great and as vital. Recog-
ion of the danger and the endurance to
a marathon, not a 100-yard dash, are
eded.

Much of the Communist strategy ob-
usly is to keep us confused, to keep us
led into complacency, to count on a lack
staying power, to keep us using up
ergy and resources in the hope that our
nomy will collapse.

Magnitude of DPA Problem

Speaking of confusion, what about Washington? Rumor to the contrary, the production side of Mr. Wilson's organization is remarkably free of confusion, thanks in great part to his leadership. Take the largest corporation in the world today, multiply its business six or eight times, fire the entire staff, which had been trained into a team over the years, and hire a new, green organization half the size, develop all the necessary policies, and you have a faint picture of the job which has to be done and is being done, not with perfect smoothness, but well.

Organization of DPA

A brief review of the defense production organizational setup might be helpful. Under the Defense Production Act of 1950, the President delegated the several functions to the various regular Government departments, which set up new agencies to meet the special needs of the program. In December, as the pattern evolved, the Office of Defense Mobilization was organized under the direction of Charles E. Wilson to provide over-all policy guidance and control. Working as one of the two arms of the ODM is the Defense Production Administration. The other arm is the Economic Stabilization Agency. The DPA coordinates the industrial production effort and directs the production activities of several agencies—principally the National Production Authority in the Department of Commerce; the defense groups for power, solid fuels, petroleum, minerals, and fisheries in the Department of the Interior; the Department of Agriculture with regard to agricultural production for industrial use; and the Defense Transport Administration. The purpose, in a word, is to assure production for defense while maintaining a sound civilian economy.

Early Operations

But even before the first organizational steps were taken we had to start operating. We knew we should require more steel, more copper, more aluminum, and more strategic materials at an early stage in the program, and so, before the detailed specifications of needs and supply could be spelled out, it became necessary to enter into limited programs for the conservation of important defense materials and for the ultimate increase of their supply.

CMP Method and Aims

The basis of the control system was the priority plan which makes use of preferential ratings on contracts issued by authorized agencies. These were first confined to the direct military programs but later extended to other essential defense activities. Ratings have never been "banded" as in World War II, but are limited to only one priority. Beginning July 1, the Controlled Materials Plan will be applied to three basic materials—steel, aluminum, and copper. While CMP will not be fully effective until the fourth quarter, much confusion will be avoided by starting in July, and the information obtained will help in bringing supply and demand into balance. CMP, of course, is a method of procedure, not a program for increasing supply. It cannot add a single ton of metal.

What CMP can do is to provide a more orderly and efficient system of distribution of basic materials. It will assure that the available supplies of the controlled materials—steel, copper, aluminum, and by indirection other materials—go to the places where they are needed in the right amounts and at the right time. By quarterly programming, it will also assure an orderly scheduling of production.

Controls are the only method we have to keep the supply of materials in balance

[1] Presented at the Fourteenth Session,
dnesday, June 20, 1951, Annual Meeting, Am.
. Testing Mats., Chalfonte-Haddon Hall,
antic City.

with the demand for them so that the growing military requirements and the increasing needs of essential defense-supporting activities are met. Also the controls provide for the equitable distribution of the remaining materials for the entire civilian economy, which must be kept at high levels.

Controls Guard Against Defense Production Shortages

Controls are simply a means to an end, and the end is production. When DPA sets a policy on the allocation of steel, for example, and the NPA orders a cutback to 70 per cent of base-period use for consumer durables, neither we nor NPA are doing that just to see the consumer durables manufacturers squirm. We must make certain that no lack of materials will hinder the military and defense-supporting programs.

If the production job is done effectively for this year and the next, we can surely look forward, sometime in 1953—unless we are attacked—to having real military security, to having a greatly expanded productive capacity which can be used for peace as well as for war, and to having the controls relaxed, and in some instances removed entirely.

Our goal is production. The genius of the country is production, and victory lies in production. Controls are merely a tool which we have to use, as sparingly as possible, to ensure fairness to all segments of our society under the stress of a huge armament program. As Mr. Wilson has repeatedly said, controls will go by the board as rapidly as possible. No one whom I know in Washington disagrees.

Sudden Need for Defense Production

Let us look at the productive situation when the fighting began in Korea. Since World War II civilian demand had greatly expanded, and the total plant capacity was being used in almost all fields. This was not only the great capacity we had in 1945—it had been increased by more than 84 billion dollars of expansion in the five postwar years. Still it was not enough. The estimates are that industry will add another 24 billion dollars to the plant capacity by the end of this year.

Last summer there was virtually no military production beyond the normal demands of the armed forces. The civilian population was almost fully employed in civilian enterprise. Farm prices were high. People had plenty of money and were clamoring to spend it. Serious inflation threatened.

It was immediately apparent that while we might have enough materials to support such an economy, we could not hope to add on top of it a big military and defense-supporting program, without greatly increasing our supply of critical materials and greatly expanding our productive resources. Stockpiling was urgently necessary. And on top of everything else, the manpower situation was tight.

As soon as the country rallied from the initial shock of the Korean explosion, it became clear what had to be done.

The forces fighting in Korea had to be supplied with enormous fire power. Our growing armed forces at home had to be equipped with weapons, tanks, planes; shoes, clothing, food—the whole catalog of military equipment. Our Allies overseas had to be helped, selectively, depending on their complex and different needs. At the same time, in order to preserve a high level of civilian activities and also to prepare for the event of all-out war, we had to expand our productive power.

Spreading Production

In the Defense Production Administration, we are operating under the policy that production must be spread across the broadest possible base. We have attempted to bring into the defense effort on prime contracts, sub-contracts, or purchased parts every qualified producer who can be used. We are greatly concerned with the problems of small business and a considerable part of our organization is charged with those problems.

It is obvious that certain major items of procurement such as ships, tanks, planes, and other highly complex industrial products can be obtained only from a limited number of sources. But many of the component parts that make up such complex end products can be—and are being—made by all kinds of manufacturers. Each procurement office in the different services has been instructed to see to it that its separate production programs involve a spreading of the load among the greatest number of businesses.

This policy is useful to the smaller business establishments and it greatly strengthens the United States economy. The health of our national economy can best be preserved by putting the greatest number of people into productive work and by keeping qualified manufacturers in profitable operation.

Expansion of Productive Resources

While we are thus broadening the base of the defense production effort, we have not been neglectful of the need for expansion of our productive resources—particularly for basic materials. Annual steel capacity is in the process of expanding to 118 million tons. Aluminum capacity will nearly double. All possible sources of strategic materials are under exploration and development.

Certificates granting five-year tax amortization have been issued for over 6 billion dollars of facilities. These expansions are financed almost entirely by private capital. Of course, this 6 billion dollars is in general in the nature of a postponement, not forgiveness, of tax liability and the actual long-run cost to the Government will be only a small proportion of the total of taxes postponed. To date, more than 4 billion dollars has been approved for the expansion of basic industries such as steel and aluminum. Before a certificate is issued, it must be clearly shown that the defense of our country is directly benefited, that there is an existing or potential shortage of capacity, that allowance is made for post-emergency usefulness, that they do not represent normal expansion, and simi criteria. Considerations of small busine regional development, ability of mana ment, availability of manpower, and ot factors are also weighed in the determi tion to grant tax amortization benefits.

Stockpiling Necessary for National Secur

Another major aspect of the curre mobilization program—the stockpiling strategic and critical materials—is vita important. Nobody knows better th the members of this Society, the imp tance of getting the right material at t right time. We hear all too frequen criticisms of the stockpiling effort, critici based on the cry that we should use c materials now, and not save them, th there is really no need to put them aw for a rainy day.

Such an attitude ignores the fact th there are certain materials in short su ply—required for some of our best engi of defense. Perhaps the critics would satisfied if they knew the amounts of th materials that are going into the sto pile. Unfortunately we cannot share su information now.

However, no unnecessary surpluses critical materials are being held in reser Our goal must be the safety of the coun even if this means some temporary c back of civilian production.

Conservation Division of DPA

The DPA has established a Conser tion Division with a staff experienced effective means of achieving the maxim conservation of scarce materials. T techniques employed are *standardizat* of specifications to provide interchan ability of parts and assemblies, as well to supply a basis for inspection and qua control; *simplification* to eliminate sh runs and heavy inventories; and *subst tion* to relieve the pressure on scarce m terials. They also seek ways of sav materials at the source of use, deve salvage programs, and encourage the claiming of usable materials.

The members of the Conservation D sion Staff also serve as advisers to Munitions Board's Standards Agency Catalog Agency, as well as to the Indus Divisions of NPA, the President's M terials Policy Commission, and to ot Government Departments.

One of the most hopeful undertaking the development of the Conservation ordinating Committee, of which the D sion Director is Chairman. This Co mittee is made up of policy-level rep sentatives of 17 Government agen having a substantial interest in mater and facilities. It acts as a clearing ho for conservation proposals, coordinates conservation activities of its memb considers broad conservation projects, a when agreed upon by a substantial ma ity of its membership, assigns the pro to one of the operating agencies.

Sacrifices Necessary for Future Welfare

Now let us take a brief look into future. It is common knowledge tha

eneral consumer durable goods producers an be permitted to use only 70 per cent of ne steel, 60 per cent of the copper, and 50 er cent of the aluminum used in the base eriod. Most businesses have not been sked to discontinue entirely the produc-on of civilian goods. In all probability, ney will not be asked to take this step. Ve are preparing today for readiness—ot for an all-out war—and readiness neans a strong working economy.

The *full* impact of materials shortages ill be felt about the beginning of next ear. Expanding capacity and leveling off f the defense program should ease the tuation by the end of 1952.

As industries are forced to cut back ivilian production, many of them will be ble to fill at least a good part of their capacity with defense orders, and there is every reason to believe that for the time immediately ahead active markets and high product demand will continue.

The mark of a strong civilized man, of a strong civilized country, is the ability properly to weigh present sacrifice against future benefits. Let us look at the present situation in its true perspective, undistorted by the all-too-human desire to feel sorry for ourselves. Present sacrifices, if they can be dignified by such a name, are small compared to the 1941–1945 years. The reward for our efforts can be peace. Our moral force coupled with our strength can assure a civilized world, a decent world. Nothing can stop us if we have faith and good will. The alternative is clear and documented and terrifying.

Committee C-21 on Ceramic Whiteware

The preparation of several tandard test methods to evaluate ce-amic whiteware is approaching the final tage in Committee C-21 on Ceramic Vhiteware. This is a result of a very xtensive study and consideration by ne subcommittees. The subcommit-ees reported at a meeting held in hicago on April 21, preliminary to the neetings of The American Ceramic ociety. Tentative methods for deter-nining true specific gravity, modulus of upture of fire dry-pressed whiteware, nd linear thermal expansion have been ubmitted to subcommittee letter ballot. urther methods being considered on ındamental properties are chipping sistance and impact resistance. In ne field of raw materials, tentative ethods on clays have been prepared r submission to the entire committee, overing sieve analysis and water con-ent, chemical analysis, sampling, and ırinkage. In the specific field of non-lastics, two methods for chemical nalysis of feldspars and nepheline enite have been approved. After the rculation of a questionnaire to the dustry, four specific control tests ave been selected for consideration of e committee.

The Subcommittee on Nomenclature ported on its extensive activity in the evelopment of numerous definitions of rms. This has been a very difficult signment, and Professor A. S. Watts of nio State University has held several parate subcommittee meetings during e past year. A group of additional rms to those already adopted by the ciety are now being reviewed, includ-g the definition of such difficult terms vitreous and its various modified rms. A group of reports by various bcommittee members have been made ailable to the committee by the Sub-mmittee on Research. These reports are expected to be published in the Bulletins of ASTM and The American Ceramic Society.

Committee D-21 Discusses Wax Polishes and Related Materials

DEFINITE programs of research and study are well under way in leading toward the development of ASTM standards in the field of wax polishes and related materials as reported by the subcommittees of Committee D-21 on Wax Polishes and Related Materials at its meeting on May 2 and 3. Subcommittees held meetings on May 2 at the Drake Hotel, Chicago, Ill., following meetings of the Chemical Specialties Manufacturers Association. On the following day, May 3, the committee went as a group to the plant of S. C. Johnson & Sons Co., Racine, Wis., where the main meeting was held following an inspection trip through the new laboratory building. This provided an interesting feature of a meeting, due to the opportunity to observe the architectural innovations in building design which has been so successfully achieved by the famous architect, Frank Lloyd Wright.

The Subcommittee on Raw Materials is studying a number of existing ASTM test methods developed for use on synthetic resins, borax, industrial water, and shellac for the purpose of recommending their use in connection with the testing of wax polishes, with or without modification. A short-range project consisting of the preparation of one type of water emulsion wax polish will be distributed to the subcommittee for cooperative tests which will include dirt and water analysis, using two methods, and an ASTM centrifuge test (D 96 T), the latter test to determine if this method gives contamination of dirt. Cooperative studies are also planned, using a combination of carnauba and paraffin waxes, for studying methods of separating wax constituents and the detection of additives.

Three task groups have been appointed in the Subcommittee on Chemical and Physical Testing, each to study an ASTM method as to its suitability for application to wax polishes. These tests cover pH (E 70 T), Kinematic Viscosity (D 445 T), and Sediment

S. C. Johnson and Sons Co. Plant.

(D 96 T). A need was expressed for a method of test for oil, but it was felt advisable to consult Committee D-2 on Petroleum, which is presently working on free oil determinations. The subject of tests for volatile solvents received considerable discussion, as this is a very extensive and comprehensive subject, and a task group is appointed to study this, including contacts with the flooring industry in order to establish what is considered harmful solvents. Round-robin testing is to be conducted on the determination of total solids, using General Services Administration Specifications 784-b, together with the method of each laboratory.

What is considered as the most difficult field of endeavor for the committee, but proposed the most important, is that of performance tests, which are set up under the jurisdiction of one of the subcommittees. Sections have been organized dealing with different phases of performance. The Section on Slip Resistance submitted an interim report of round-robin tests, using Underwriters' Laboratory and Sigler Machines. It was pointed out that a standard surface is an important and still unsettled factor. A task group has been designated to work on this specific problem. Further work is required to eliminate variation in test results, using untreated samples, and in addition, another series of tests will be run on treated samples, using the standard procedure of preparation of surface. The Section on Service Life has proposed to submit several of the generally accepted test methods to round-robin testing for establishing information on water resistance, flexibility and cohesion, and hardness. The Section on Appearance discussed reviewed projects which it will undertake. Panel tests, as outlined in G.S.A. Specification 784-b, will be set up, using three materials, namely, Totl, asphalt tile, and rubber tile. The mohair application method and the Fisher dip method were proposed as projects of the section.

Subcommittee V on Specifications, realizing that the committee is not in the position to write specifications until more adequate test methods are provided, agreed upon a long-range program. Consideration is recommended to lustrous drying water emulsion waxes of the industry type. All existing specifications will be reviewed and studied for the purpose of adopting the features desired. The importance of proper procedures for the cleaning, waxing, and maintenance of floor surfaces, including linoleum, asphalt tile, rubber tile, and wood, was stressed. It was the consensus that the committee might well consider a recommended practice, but the development of such would not come under the jurisdiction of this subcommittee. The next meeting of the committee is planned for December 5 and 6.

Committee D-22 on Methods of Atmospheric Sampling and Analysis

ALTHOUGH no meeting of Committee D-22 has been held since the organizational meeting on Jan. 9, 1951, two Executive Subcommittee meetings took place the second of which was held June 14. One of the tasks completed by this group is the selection of chairmen of the standing subcommittees. These chairmen are as follows:

Subcommittee I—Nomenclature and Units
C. E. Lapple, School of Engineering, Ohio State University, Columbus, Ohio

Subcommittee II—Methods of Sampling
Leslie Silverman, Harvard School of Public Health, Harvard University, Boston, Mass.

Subcommittee III—Analytical Methods
J. Cholak, The Kettering Laboratory, University of Cincinnati, Cincinnati 19, Ohio

Subcommittee IV—Instrumentation
M. D. Thomas, American Smelting a[illegible] Refining Co., Salt Lake City, Utal[illegible]

Assignments to these various subco[illegible] mittees are currently being made a[illegible] anyone interested in working on one[illegible] more of the subcommittees and who [illegible] received no communication regard[illegible] an assignment should contact

H. H. Schrenk, Secretary, ASTM Co[illegible] mittee D-22
Industrial Hygiene Foundation
4400 Fifth Ave.
Pittsburgh 13, Pa.

There will be a meeting of Commit[illegible] D-22 on Methods of Atmosph[illegible] Sampling and Analysis and the vari[illegible] subcommittees at ASTM Headquart[illegible] 1916 Race St., Philadelphia 3, Pa. T[illegible] dates are as follows:

Subcommittees—Oct. 1–2, 1951
Main Committee—Oct. 2, 1951 (p.m.[illegible]

One of the items on the agenda [illegible] be the approval of the By-Laws as p[illegible] pared by the special By-Laws Subco[illegible] mittee.

As this is the first business meeting [illegible] this committee, it would be desira[illegible] for all the members to be present.

Committee E-10 on Radioactive Isotopes Organized

AN ORGANIZATION meeting of Committee E-10 on Radioactive Isotopes was attended by approximately 35 members and visitors on June 21. Following an introduction of each person with a short statement of his field of interest, a detailed discussion took place on the activities of the new committee and its place in the ASTM committee structure. It was decided that the following items should be given prompt consideration:

1. Bibliography of terms
2. The application of isotope techniques to present ASTM methods of test
3. Standardization of measurement[illegible]
4. Health and safety measures
5. Instrumentation
6. Natural occurring radiation

The meeting asked Dr. G. G. Ma[illegible] of the Atomic Energy Commssion [illegible] continue as temporary chairman [illegible] D. M. McCutcheon of the Ford M[illegible] Co. as temporary secretary. The ch[illegible] man was authorized to appoint [illegible] nominating committee to presen[illegible] slate of officers for election on a [illegible] manent basis at the next meet[illegible] which it was decided would be [illegible] during the 1952 ASTM Commi[illegible] Week, in Cleveland, March 3 to 7.

New 1951 Sustaining Memberships Total Thirty-Two

SINCE publication of the May BULLETIN four additional companies have subscribed to ASTM Sustaining Membership, bringing the total of such memberships since the first of the year to 32. Those most recently transferring to this class are the following:

Aluminium Laboratories, Ltd., R. H. Rimmer, Director of Research.
Brooklyn Union Gas Co., E. J. Murphy, Chief Chemist.
Mutual Chemical Company of Ame[illegible] O. F. Tarr, Vice-President.
Sinclair Refining Co., Albert E. M[illegible] Assistant to Vice-President and F[illegible] ess Chemist.

Each of these companies particip[illegible] actively in ASTM committee work.

The Board of Directors of the [illegible] ciety is most appreciative of the sup[illegible] of some 240 of the country's lea[illegible] companies through this class of af[illegible] tion. A booklet describing Sustai[illegible] Membership will be sent to any org[illegible] zation interested.

᾿ERSONALS...

News items concerning the activities of our members will be welcomed for inclusion in this column

NOTE—*These "Personals" are arranged in order of alphabetical sequence of the names. requently two or more members may be referred to in the same note, in which case the first e named is used as a key letter. It is believed that this arrangement will facilitate reference the news about members.*

At the 55th Annual Convention of the merican Foundrymen's Society in Buflo several active ASTM members ere in the news. The Charles Edgar oyt Annual Lecture, the top technical ldress of the four-day program, was livered by **James C. Zeder**, Director of ngineering and Research, Chrysler Corp., etroit, Mich. Among those awarded FS Gold Medals for outstanding serve to the industry were **Alfred A. Boyles**, esearch and Development Dept., United tates Pipe & Foundry Co., Burlington, . J., and **V. A. Crosby**, Metallurgical ngineer, Climax Molybdenum Co., Deoit. Included in the newly elected irectors were **Harry W. Dietert**, Presient, Harry W. Dietert Co., Detroit, and ames T. MacKenzie, Technical Director, merican Cast Iron Pipe Co., Birmingam, Ala.

The Nominating Committee of the merican Society for Metals has named e following ASTM men to serve as ofcers during the 1951–1952 term: as ice-president, **Ralph L. Wilson**, Director f Metallurgy, Timken Steel & Tube iv., Timken Roller Bearing Co., Canton, hio; as trustees, **J. B. Johnson**, Chief f Materials Div., Wright-Patterson Air orce Base, Dayton, Ohio, and **George A. oberts**, Chief Metallurgist, Vanadiumlloys Steel Co., Latrobe, Pa.

Wayland S. Bailey, formerly Associate rofessor of Mechanical Engineering, orwich University, Northfield, Vt., has ccepted a position as Project Engineer, inney Mfg. Co., Jamaica Plain, Mass.

Charles Albert Bicking is now in the esearch & Development Div., Dept. of efense, Office of the Chief of Ordnance, Vashington, D. C. He was previously ssociated with the Hercules Powder Co., Vilmington, Del., as Quality Control ngineer.

Lloyd R. Bittle is now affiliated with the anadian General Electric Co., Ltd., Davnport Works, Toronto, Canada. He was ormerly with John T. Hepburn Co., Ltd., f the same city.

On June 18, the day before he received he ASTM Award of Merit (see elsewhere this BULLETIN), **William Blum**, Chief, lectrodeposition Section, National Buau of Standards, was honored by Frankrd Arsenal, Philadelphia, Pa., when he as presented with a plaque in the form f the flaming bomb symbol of the Ordance Corps, acknowledging his important echnical work in behalf of the Arsenal ith which he has been associated for lmost a decade. The plaque contained e following inscription: "Presented to Dr. William Blum in tribute to his years of service as adviser to Frankford Arsenal on Ordnance Corps electrochemical problems. Frankford Arsenal, 18 June 1951. Colonel W. E. Becker, Commanding."

Ralph R. Britton, has resigned as Chief Engineering Adviser, Housing and Home Finance Agency, Washington, D. C., and has opened his own offices as Consulting Engineer in that city.

Bradley Allen Burnside, formerly Research & Development Manager, Timber Structures, Inc., Portland, Ore., is now Product Engineer, American Lumber and Treating Co., Chicago, Ill.

Harry Van Osdall Churchill, who had been Chief of the Analytical Division of Aluminum Research Laboratories and Chief Chemist of Aluminum Company of America, New Kensington, Pa., since 1919, retired from this position as of July 1. His son, **John Raynor Churchill**, who is well known for his spectrographic work and his membership on the Editorial Committee for *Analytical Chemistry*, will succeed him as Chief of the Analytical Division of Aluminum Research Laboratories. For news of a signal honor from ASTM extended Mr. H. V. Churchill, turn to the section of this BULLETIN announcing ASTM'ers receiving 1951 Awards of Merit. Both these men have been very active for many years in ASTM Committee E-2 on Emission Spectroscopy.

On June 1, **Myron Park Davis**, one of the two or three men still in the Society who worked for Charles B. Dudley, the Society's first President when he was the famed Chief Chemist of the Pennsylvania Railroad Co. at Altoona, retired from his long-time position as Chief Chemist and Metallurgist, Otis Elevator Co., Yonkers, N. Y. Active in ASTM for many years, Mr. Davis served not only on technical committees but in other capacities. He was Chairman of Committee D-9 on Electrical Insulating Materials for four years, and he headed the New York District Council from 1939 through 1950. One of his more recent activities has been his service as Chairman of the ASA Safety Code Correlating Committee. He plans to continue this important responsibility. It is not expected that he will remain entirely out of ASTM activities. Mr. Davis is continuing his residence at 149 N. Broadway, North Yonkers, N. Y., where he can be addressed.

Carl L. Engelhardt, Technical Director, Brooklyn Varnish Manufacturing Co., Inc., Brooklyn, N. Y., has been elected to the board of directors of his company. He has been associated with the company in various capacities since 1931. Mr. Engelhardt is an active member of the New York Paint & Varnish Club, and of ASTM Committee D-1 on Paint, Varnish, Lacquer, and Related Products.

Harry L. Ericson has been appointed Chief Chemist of the new laboratory of Continental Carbon Co., Amarillo, Texas, an affiliate of the Witco Chemical Co.

S. G. Eskin, formerly Director of the West Coast Research and Development Laboratory of Robertshaw-Fulton Controls Co., Los Angeles, Calif., is now Technical Adviser in the executive offices of the company in Greensburg, Pa.

Bernard W. Gamson has been appointed Director, Research and Development Div., Great Lakes Carbon Corp., Morton Grove, Ill. He was previously Chief Process Engineer for Great Lakes Carbon Corp. with head-quarters in Chicago.

Joseph M. Gentile, District Manager of the Buffalo District, Pittsburgh Testing Laboratory, was elected Vice-President (1951–1952) of the Engineering Society of Buffalo. He has been a Director of ESB since 1949.

Albert T. Goldbeck, Engineering Director, National Crushed Stone Assn., Washington, D. C., early this year received the Distinguished Service Award of the Highway Research Board. This was given to him in recognition of outstanding achievement in the field of highway research. For additional news of a signal honor from ASTM tendered Mr. Goldbeck, one of our most active members, turn to the section of this BULLETIN announcing new Honorary Members.

Lois V. Hans, formerly Laboratory Coordinator, St. Regis Paper Co., Deferiet, N. Y., is now Technologist, Philadelphia Quartermaster Depot, Philadelphia, Pa.

J. Bennett Hill, Director of Chemical and Engineering Research, Sun Oil Co., Marcus Hook, Pa., was presented with a "Certificate of Appreciation" from the Research Committee of the Board of Directors, American Petroleum Institute, presentation being made at the A.P.I. 30th Annual Meeting in Los Angeles. Mr. Hill has been associated for many years with the Institute's fundamental research program.

E. E. Howe has been appointed Director of Research of Chicago Vitreous Enamel Product Co., Cicero, Ill.

James T. Kemp again is serving the Government, this time in the Defense Minerals Administration, U. S. Bureau of Mines, Washington, D. C., where he transferred from his position as Metallurgical Engineer of the American Brass Co., San Francisco, Calif. Affiliated with the American Brass for many years, Jim rendered outstanding service to the War Production Board in Washington during World War II, and later with an Economic and Materials Mission in London. He has been a loyal ASTM member for many years, and prior to his transfer was serving as Chairman of the Northern California District's Membership Committee.

Whelan W. Klemme, Jr., has accepted a position as Chemist with the Monsanto Chemical Co., Monsanto, Ill. He was previously associated with the Eagle Foundry Co., Belleville, Ill.

G. A. Lillieqvist, Research Director and Chief Metallurgist, American Steel Foundries, East Chicago, Ind., received the annual *Steel Foundry Facts* award for excellence of material published in that publication.

Clarence H. Lorig, Assistant Director, Battelle Institute, Columbus, Ohio, recently received from the University of Wisconsin a Distinguished Service Citation for accomplishments in the field of metallurgical engineering. Dr. Lorig's undergraduate and graduate studies in mining and metallurgy at the University set the foundation for his long career in engineering and industrial research. He is credited with research leading to eleven patents on alloys and metallurgical processes, and recent experience has brought him into close association with the development of many of the refractory metals. Last year he was awarded the Joseph S. Seaman Gold Medal for metallurgical research by the American Foundrymen's Society.

James T. MacKenzie, Technical Director, American Cast Iron Pipe Co., Birmingham, Ala., is the 1951 winner of the Herty Medal, sponsored by the Chemistry Club of the Georgia State College for Women and administered by the Georgia Section of the American Chemical Society. This award, first given in 1933, is named in honor of the late Charles H. Herty, an ACS Past-President and originator of the commercial process for making paper pulp from southern pine. Mr. MacKenzie was selected from nominations made by ACS sections of the Southeast for his research in metals. In his acceptance address he referred to the early history of the cast iron pipe industry citing the earliest installation built in 1455 to provide water for a German castle as still in service prior to World War II, giving high lights in development of the industry through the years, and specifically referring to the successful industrial application of the Golden Rule in the operations of his own company since 1922. Affiliated with ASTM for more than 30 years, Mr. MacKenzie is a Past-Director of the Society, a Past-Chairman of Committee A-3 on Cast Iron, and continues to render important service on numerous subcommittees of the Cast Iron group.

Elmer H. McDowell, upon completion of graduate studies at the Illinois Institute of Technology, Chicago, has accepted an appointment as Building Construction and Technical Drawing Instructor, Kansas Technical Institute, Topeka.

William H. McKenna was recently elected Vice-President of Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa. Joining the company in 1936 as Purchasing Agent, Mr. McKenna was advanced in 1942 to Assistant to the President, holding that position until his present appointment.

Paul D. Miesenhelder has joined the Research Staff of the Engineering Division, Association of American Railroads, at the Association's new Central Research Laboratory, 3140 South Federal St., Chicago, Ill., as Concrete Engineer. For many years Mr. Miesenhelder was with the Indiana State Highway Commission, serving as Engineer of Tests and Assistant Chief Engineer; and from 1949 to 1951 he was Assistant Materials Engineer with the Pennsylvania Turnpike Commission. Affiliated with ASTM since 1921, he formerly served on Committee C-1 on Cement, and Committee C-9 on Concrete and Concrete Aggregates.

Leslie I. Neher, formerly associated with the Pumex Corp., Albuquerque, N. Mex., has accepted a position as Industrial Engineer, Central Indiana Gas Co., Muncie, Ind.

K. S. Raghavachary has been named Chief, Highways Div., ECAFE, Bangkok, Thailand. He was previously located at New Delhi as Consulting Engineer, Government of India.

G. A. Reinhardt, for many years Director of Metallurgy and Research, Youngstown Sheet and Tube Co., Youngstown, Ohio, and active in ASTM for many years, retired on May 1. Widely known throughout the steel industry, and with many friends in the Society, Mr. Reinhardt had been active on many ASTM technical committees, notably A-1 on Steel, A-5 on Corrosion of Iron and Steel, certain ASA Sectional Committees, and was for years on the former Committee on Heat Treating. He was a member of the Cleveland District Council, and from 1930 to 1932 he was a member of the Board of Directors of the Society. **J. W. Kirkpatrick,** Chief Metallurgist, is replacing Mr. Reinhardt as the official representative of the company's membership in ASTM.

F. B. Riggan, formerly General Manager in Charge of Manufacturing, Key Co., East St. Louis, Ill., has been named Vice-President in Charge of Research and Development.

Frederick D. Rossini, Professor and Head of the Department of Chemistry, and Director of the Petroleum Research Laboratory, Carnegie Institute of Technology, Pittsburgh, Pa., has been elected to the National Academy of Sciences, being one of 29 American scientists recently elected to the group. A graduate of Carnegie in 1925, Dr. Rossini is the first Carnegie alumnus to gain this high national honor, and the 14th in the State of Pennsylvania. In his years of fundamental research Dr. Rossini has given the oil industry basic knowledge important in developing processes for securing more gasoline from a given amount of petroleum and for producing high-octane fuels.

D. G. Runner, formerly a Commodity Specialist in the Construction and Chemical Materials Branch of the Bureau of Mines, has accepted a position as Chief of the Cement and Cement Products Section, Building Materials Division of the National Production Authority, Department of Commerce, Washington, D. C.

Evan M. Shay has accepted an appointment as Chief Laboratory and Field Engineer, O. J. Porter & Co., Los Angeles, Calif.

T. E. Stanton, for many years Materials and Research Engineer, California Division of Highways, Sacramento, retired as of May 31. As representative of the ASTM membership of the Californi Division since 1931, he had made a num ber of valuable contributions to the wor of the Society, serving through the year on the technical groups concerned with so for engineering purposes, road and pavin materials, cement, and concrete and con crete aggregates. He was a member of th Northern California District Council, an rendered important service on the Techn cal Program Committee of the Firs ASTM Pacific Area National Meeting i San Francisco in 1949, and in other ways. **F. N. Hveem** has been appointed by th California Division of Highways to suc ceed Mr. Stanton as Materials and Re search Engineer, and will represent th Division in the Society.

Oliver W. Storey, Director and Secre tary of the Burgess Cellulose Co., an Consultant for Burgess Battery Co., Ch cago, Ill., was among five nationally know engineers and industrialists cited for ou standing accomplishments in their fiel at the Engineers' Day dinner of the Un versity of Wisconsin in May. Mr. Store is a long-time ASTM member, havin been affiliated since 1915.

Robert L. Sumwalt, Dean of the Scho of Engineering, University of South Car lina, Columbia, has been elected Chairma for the coming year of the Southeaste Section of the American Society for Eng neering Education.

Thor Svenzon, formerly Superintenden Engineer, Almedahl-Dalsjofors A.B., Dal jofors, Sweden, is now Managing Dire tor of Holma-Helsinglands Linspinne & Vafveri A.B., Sorfosa, Sweden.

Lewis A. Tomes is now located at th National Bureau of Standards, as R search Associate for the Calcium Chl ride Assn., Washington, D. C. He w previously Junior Inspector, District Columbia, Highway Department.

Joseph P. Urbanek has been tran ferred from the Philadelphia Quartermast Depot to the Office of the Quartermast General, Washington, D. C.

Francis F. Villa, formerly Chemi Cords Ltd., Division of Essex Wire Cor Newark, N. J., is now associated with t Accurate Insulated Wire Corp., Ne Haven, Conn., in a similar capacity.

Paul E. Willard has been promoted Assistant Director of Research of t Ohio-Apex Division of Food Machine and Chemical Corp., Nitro, W. Va.

A. J. Williamson is now Vice-Presiden Tube Reducing Corp., Wallington, N. He was previously Plant Manager, Colum bia Steel & Shafting Co., Pittsburgh, Pa.

Robert E. Wilson, Chairman of t Board of the Standard Oil Co. (Indiana delivered the third Cadman Memori Lecture of the Institute of Petroleum, the Royal Institution, London, on Ju 21. Formerly the representative of h company in ASTM and very active in t work of Committee D-2 on Petroleu Products and Lubricants, Dr. Wilson h been an honorary member of that gro since 1941.

H. J. Wolthorn has been made Chi Chemist of the U. S. Steel Co., Fairle Works, now under course of constructi at Morrisville, Pa.

NEW MEMBERS . . .

The following 138 members were elected from April 24, 1941, to June 20, 1951, making the total membership 7044 . . . Welcome to ASTM

Note—Names are arranged alphabetically—company members first, then individuals

icago District

RD MOTOR CO., AIRCRAFT ENGINE DIVISION, James Knowles, Chief Engineer, 7401 S. Cicero Ave., Chicago 29, Ill.

CTOR MANUFACTURING AND GASKET CO., Paul F. Nissen, Director of Research and Assistant Works Manager, 5750 W. Roosevelt Rd., Chicago 50, Ill.

ALKER AND SONS, INC., HIRAM, Leonard Stone, Research Director, Research Dept., Peoria, Ill.

OTTON, WILLIAM J., Owner, W. J. Cotton Laboratories, 3530 W. Fairmount Ave., Milwaukee 9, Wis.

RAMPTON, DONALD S., Sales Engineer, Felt Products Manufacturing Co., 1504–1514 Carroll Ave., Chicago 7, Ill. For mail: 19932 Livernois Ave., Detroit 21, Mich.

RASE, RAY E., Sales Manager, Addison-Semmes Corp., 1800 Thurston Ave., Racine, Wis.

ARSEN, FINN J., Assistant to Director of General Research, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

OVEWELL, CECIL E., Sales Manager and Service Engineer, Combustion By-Products Co., 228 N. LaSalle St., Chicago, Ill.

IEAD PUBLIC LIBRARY, Marie W. Barkman, Chief Librarian, Sheboygan, Wis.

IOORE, W. T., Supervisor, Physical Testing Lab., Reynolds Metals Co., Brookfield, Ill.

HILLIPS, A. G., Metallurgist, Caterpillar Tractor Co., Box 1504, Joliet, Ill.

AHN, L. A., Director of Petroleum Services, Illinois Farm Supply Co., Marine Terminal, Kingston Mines, Ill.

OSEN, C. G. A., Consulting Engineer, Caterpillar Tractor Co., Peoria 8, Ill.

HOMAS, W. E., Vice-President, Sales, Magnaflux Corp., 5900 Northwest Highway, Chicago 31, Ill.

HORSHOV, ROY NORMAN, President, Thorshov & Cerny, Inc., 400 Metropolitan Bldg., Minneapolis 1, Minn.

VEHMER, FRED, Chemical Engineer, Minnesota Mining and Manufacturing Co., 900 Fauquier Ave., St. Paul 6, Minn.

VELLING, EDWARD G., Engineer, John Mohr and Sons, 3200 E. Ninety-sixth St., Chicago, Ill. For mail: 5915 S. Emerald Ave., Chicago 21, Ill.

VILCOX, F. A., Assistant to Director of Purchases, Kraft Foods Co., 500 Peshtigo Court, Chicago 90, Ill.

leveland District

ERTIFIED ALLOYS CO., Harold H. Barnett, Owner, 5463 Dunham Rd., Bedford, Ohio.

LITTMAN, JOSEPH B., Director of Laboratories and Research, Packard Electric Division, General Motors Corp., Warren, Ohio.

POOLE, SIDNEY WILSON, Research Metallurgist, Republic Steel Corp., Metallurgical Lab., Canton 4, Ohio. For mail: 1346 Twenty-second St., N. W., Canton 9, Ohio.

SMITH, WILLIAM FRANCIS, Technical Director, Vanguard Paints and Finishes, Inc., Marietta, Ohio.

Detroit District

DEARBORN MOTORS CORP., Ralph E. Hunt, Vice-President in Charge of Engineering and Manufacturing, 2500 E. Maple, Birmingham, Mich.

ANDERSON, JAMES W., JR., President, Monarch Governor Co., 1832 W. Bethune Ave., Detroit 6, Mich.

FORD, J. C., Cadillac Malleable Iron Co., Cadillac, Mich.

MACLEOD, ALBERT, Chemical Engineer, The Dow Chemical Co., Coatings Technical Service, 6-433 Bldg., Midland, Mich.

QUIGLEY, FRED K., JR., Coatings Technical Service, The Dow Chemical Co., Midland, Mich.

WESTERN MICHIGAN COLLEGE LIBRARY, Hazel M. DeMeyer, Order Librarian, Kalamazoo 45, Mich.

New England District

GENERAL ELECTRIC CO., John Z. Witbeck, Metallurgical Engineer, 166 Broad St., Fitchburg, Mass.

GOLDSTEIN, HERMAN B., Manager of Production and Research, Warwick Chemical Co., Division Sun Chemical Corp., Wood River Junction, R. I.

LEONARD, JOHN S., Head Engineer, Electric Boat Co., Groton, Conn.

TUFTS, NATHAN, Trustee, Container Associates, 3 Bank Row, Greenfield, Mass. For mail: 500 Main St., Greenfield, Mass.

New York District

ARMA CORP., Sidney C. Smith, Manager, Inspection and Quality Control Div., 254 Thirty-fourth St., Brooklyn 32, N. Y.

ATLANTIC TILE MANUFACTURING CO., Karl M. Claus, Vice-President, Atlantic Ave., Matawan, N. J.

ELECTRO-TECHNICAL PRODUCTS DIVISION, SUN CHEMICAL CORP., R. L. Schwebel, Senior Chemist, 113 E. Centre St., Nutley 10, N. J.

GENERAL CERAMICS AND STEATITE CORP., Erwin Hurst, Ceramic Engineer, Keasbey, N. J.

L-R HEAT TREATING CO., A. J. Quaglia, Metallurgist, 107 Vesey St., Newark, N. J.

NEW JERSEY QUILTING CO., INC., William MacMurren, Vice-President, 232 Central Ave., Jersey City, N. J.

ROSS & ROBERTS, INC., Arthur M. Ross, Jr., President, Stratford, Conn.

BLACK, OWEN J., Mechanical Engineer, Socony-Vacuum Oil Co., Inc., 412 Greenpoint Ave., Brooklyn 22, N. Y. For mail: 2600 Marion Ave. New York 58, N. Y. [J]*

BREGMAN, ADOLPH, Consulting Engineer, 123 William St., New York 38, N. Y.

BRONSON, HARL HOWARD, Metallurgist, Picatinny Arsenal, Dover, N. J. For mail: 1 Mt. Hope Ave., Dover, N. J.

BROOKHAVEN NATIONAL LABORATORY, RESEARCH LIBRARY, John P. Binnington, Librarian, Upton, L. I., N. Y.

CLARK, JOHN B., Engineer, Esso Standard Oil Co., 15 W. Fifty-first St., New York, N. Y. For mail: 380 Ocean Terrace Staten Island 4, N. Y.

DESANTIS, VINCENT J., Development Engineer, General Electric Co., 1 River Rd., Schenectady, N. Y. For mail: 1079 Parkwood Blvd., Schenectady 7, N. Y.

GATHMAN, ALBERT, Head, Sales Service Lab., Esso Standard Oil Co., Linden, N. J.

GILBERT, JULES, Chemical Engineer, Technical Service Div., Westvaco Chemical Division, Food Machinery and Chemical Corp., 405 Lexington Ave., New York, N. Y.

GORSKI, JOSEPH P., Tool Designer, Electrolux Corp., Old Greenwich, Conn. For mail: 44 Brown Ave., Stamford, Conn.

HARDING, W. C., M. and P. Engineer, Westinghouse Electric Corp., Elevator Div., 150 Pacific Ave., Jersey City, N. J.

HAUFE, OTTO, Research Director, Turner Halsey Co., 40 Worth St., New York 13, N. Y.

HIRSCHTHAL, MEYER, Consulting Engineer, Hirschthal & King, 347 Madison Ave., New York 17, N. Y.

HOLTZMAN, HARRIS, Chief Chemist, Ansbacher-Siegle Corp., Rosebank, Staten Island 5, N. Y.

JONES, EDWARD L., Administrator, Works Lab., Oneida, Ltd., Manufacturing Dept., Oneida, N. Y.

KELLY, ROBERT S., Chief Chemist, Wilbur B. Driver Co., 150 Riverside Ave., Newark 4, N. J.

LESTER, WILLIAM M., President and General Manager, Pyro Plastics Corp., 690 Chestnut St., Union, N. J.

MACALUSO, PAT, Senior Research Chemist, Stauffer Chemical Co., Chauncey, N. Y.

MAPES, FRED S., Mechanical Section Engineer, General Electric Co., Schenectady 5, N. Y.

PARKER, T. D., Metallurgical Engineer, Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.

PERRY, DANIEL, Architect, 1213 Main St., Port Jefferson, N. Y.

To the ASTM Committee on Membership

1916 Race St., Philadelphia 3, Pa.

Gentlemen:

Please send me information on membership in ASTM and include a membership application blank.

Signed ____________________

Address ____________________

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Date ____________________

RYAN, PHILIP, Chief Chemist, The Plume & Atwood Manufacturing Co., Thomaston, Conn.

STREHAN, GEORGE E., Consulting Engineer and Architect, 100 Palmer Pl., Leonia, N. J.

VENIA, THEODORE A., Textile Technologist, Cantor-Greenspan Co., Inc., 469 Seventh Ave., New York, N. Y.

WILLIAMS, DUNCAN B., Manager, Special Products Div., Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corp., 30 E. Forty-second St., New York 17, N. Y.

Northern California District

JACK, ORVILLE E., Chief Chemist, Permanente Cement Co., Permanente, Calif. For mail: 1188 Kotenberg Ave., San Jose 25, Calif.

Ohio Valley District

CLARK, MYRON J., Technical Service Engineer, Inland Container Corp., 700 W. Morris St., Indianapolis 6, Ind.

DIETSCH, F. F., Specifications Engineer, Reynolds Metals Co., 2500 S. Third St., Louisville, Ky.

GUSTAFSON, C. R., Chief Engineer, Containers and Materials Handling Div., American Radiator and Standard Sanitary Corp., 1541 S. Seventh St., Louisville 8, Ky.

HUGHES, ARTHUR V., Research Engineer, Battelle Memorial Inst., 505 King Ave., Columbus 1, Ohio.

JOSLIN, JOHN GRANT, Engineer, Soil Section, Ohio State Highway Testing and Research Laboratory, Ohio State University Campus, Columbus 10, Ohio. For mail: 83 Northridge Rd., Columbus 14, Ohio.

KLEINFELDT, A. H., Product Supervisor, Reynolds Metals Co., 2500 S. Third St., Louisville, Ky.

PERKINS, D. E., Architect and Engineer, Harlan, Ky.

SCOTT, MORRIS D., Laboratory Supervisor, Ranco, Inc., 601 W. Fifth Ave., Columbus 1, Ohio.

SMITH, CHARLES H., Technical Director, Kurfees Paint Co., 201 E. Market, Louisville, Ky.

Philadelphia District

QUAKER CHEMICAL PRODUCTS CORP., Robert C. Medl, Technical Director, Lime, Sandy and Elm Sts., Conshohocken, Pa.

SALLE METALS CO., INC., THE GEORGE, Frank J. Daniels, Sales Manager, Westmoreland and Tulip Sts., Philadelphia 34, Pa.

ARMSTRONG, W. GRIER, Chemist, E. I. du Pont de Nemours and Co., Inc., Newport, Del.

DAMON, H. GILROY, Civil Engineer, Damon & Foster, Chester Pike and High St., Sharon Hill, Pa.

GALLOWAY, F. M., Technical Superintendent, Quaker Rubber Corp., Comly and State Sts., Philadelphia 24, Pa.

LAWRENCE, JOHN R., Group Leader, Development Lab., Rohm & Haas Co., Bristol, Pa. For mail: 210 W. Mt. Pleasant Ave., Philadelphia 19, Pa. [J]

NUNNALLY, B. L., Plant Manager, The McKay Co., Lock Drawer 747, York, Pa.

REED, JOHN J., Chemist and Development Engineer, Panelyte Division of St. Regis Paper Co., Trenton, N. J. For mail: 237 W. Clapier St., Philadelphia 44, Pa. [J]

SCHELL, THEODORE WILLIAM, Materials Engineer, Tioga Construction Co., Box 509, Lancaster, Pa.

WARDEN, WARREN B., Consulting Chemical Engineer, Miller-Warden Associates, 731 Yale Ave., Swarthmore, Pa.

Pittsburgh District

HUNTER, CALDWELL & CAMPBELL, John Hunter, Jr., Partner, P. O. Drawer 911, Altoona, Pa.

MINE SAFETY APPLIANCES CO., John P. Strange, Principal Physicist, John T. Ryan Memorial Lab., Penn and Braddock Aves., Pittsburgh 8, Pa.

EMERSON, ROY W., Metallurgist, Pittsburgh Piping and Equipment Co. 10 Forty-third St., Pittsburgh 1, Pa.

LYON, E. W., Mining Engineer, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

MARSALKA, JOSEPH J., Technical Director, Roll Manufacturers Inst., 826 Farmers Bank Bldg., Pittsburgh 22, Pa.

MYERS, HOWARD B., Metallurgical Engineer, S. H. Bell Co., 1514 Oliver Bldg., Pittsburgh 22, Pa.

ROSSINI, FREDERICK D., Professor, Carnegie Institute of Technology, Pittsburgh 13, Pa.

St. Louis District

DUVAL D'ADRIAN, V. L., President, Mississippi Valley Research Laboratory, 901 S. Eighteenth St., St. Louis 3, Mo.

HUMPHREYS, ELLIS, Vice-President, Mississippi Glass Co., 88 Angelica St., St. Louis 7, Mo.

REITZ, HENRY M., Assistant Professor, Washington University, St. Louis 5, Mo.

SOUTHERN ILLINOIS UNIVERSITY, GENERAL LIBRARY, Carbondale, Ill.

Southern California District

CLEMONS, JOHN M., President, Ferro-Spec Laboratories, Inc., 4112 S. Main St., Los Angeles 37, Calif.

STERLING, MORTON A., Vice-President, Sunset Oil Co., 530 W. Sixth St., Los Angeles 14, Calif.

Washington (D. C.) District

FINK, G. J., Consultant, 5429 Connecticut Ave., Washington 15, D. C.

GEORGE, DESMOND A., Physicist, National Bureau of Standards, Washington, D. C. For mail: 3606 First Rd., S., Arlington, Va.

MICHETTI, ALBERT L., Engineering Research Specialist, Reynolds Metals Co., Third and Grace Sts., Richmond, Va. For mail: 5344 Wright Ave., Baltimore 5, Md.

MILTON, CLARE L., JR., Plastics Development and Production, Eastern Venetian Blind Co., 1601 Wicomico St., Baltimore 30, Md.

PEEBLES, JOHN KEVAN, JR., Partner and Chief Engineer, Baskervill and Son, 2313 W. Cary St., Richmond 20, Va.

ROBBINS, WILBUR E., Head, Fuels Di Fuels and Lubricants Project, U. S. Na Engineering Experiment Station, A napolis, Md. For mail: 1218 Guildf Rd., Harundale, Glen Burnie, Md.

WALFORD, J. BINFORD, Architect, J. Binf Walford, O. Pendleton Wright, Arc tects, 103 E. Cary St., Richmond 19, Va.

Western New York-Ontario District

COPE AND SONS, LTD., A., H. E. Cop President, 19 Albert St., Hamilton, On Canada.

G. L. F. FARM SUPPLIES, W. Stuart Mill Director of Purchasing, G.L.F. Bldg Ithaca, N. Y.

BARGMAN, MAX, Components Engine Sylvania Electric Products, Inc., 2 Rano St., Buffalo, 7, N. Y.

BITTLE, LLOYD R., Production Cont Engineer, John T. Hepburn Co., Ltd., 91 948 DuPont St., Toronto, Ont., Canad For mail: 316 Montrose Ave., Toronto Ont., Canada.

ENGLE, HARVEY R., Chemist, Hooker El trochemical Co., Niagara Falls, N. Y.

EVANS, ELMA T., Librarian, Cornell Ae nautical Laboratory, Inc., 4455 Gene St., Buffalo 21, N. Y.

WATT, DANIEL GREY, Research Engine Hydro-Electric Power Commission Ontario, 620 University Ave., Toron Ont., Canada.

U. S. and Possessions

WHELAND CO., The, Charles S. Chisolm, S perintendent, Metallurgy and Test 27 S. Broad St., Chattanooga 2, Tenn.

FLORIDA STATE UNIVERSITY, Earl C. Sma ley, Assistant Resident Engineer, Tal hassee, Fla.

FREY, D. R., Manager, Products Appli tion, Deep Rock Oil Corp., Research a Development Dep., Cushing, Okla.

GIROD, OSCAR M., Plant Manager, Por Cement Corp., Box 351, Ponce, Pue Rico.

HALL, WILLIAM G., Assistant Chief Chemi Shell Chemical Corp., Box 2633, Houst Tex. For mail: 214 W. Jackson S Pasadena, Tex.

LAWLESS, DON A., Material Engineer, Kai Aluminum and Chemical Corp., Box 14 Spokane, Wash.

PRATT, HORACE L., Director of Laborat Columbia Mills, Mt. Vernon-Woodb Mills, Inc., Box 630, Columbia, S. C.

ST. PETERSBURG, CITY OF, P. J. Jorgens City Engineer, Municipal Bldg., St. Pete burg, Fla.

SMITH, J. D., Chief Chemist, Internatio Lubricant Corp., Box 390, New Orlea La.

WILSON, J. PAUL, Owner, Wilson Test Laboratory, Route 1, Box 240, Cle water, Fla.

Other than U. S. Possessions

BRITISH STEEL FOUNDERS' ASSN., RESEA AND DEVELOPMENT DIV., J. F. B. Jack Director of Research, Broomgrove Lod 13 Broomgrove Rd., Sheffield 10, E land.

CANADIAN LABORATORY SUPPLIES, LT

To the ASTM Committee on Membership, 1916 Race St., Philadelphia 5, Pa.

Gentlemen:

Please send information on Membership to the company or individual indicated below:

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____

This company (or individual) is interested in the following subjects: (indicate field of activity, that i petroleum, steel, non-ferrous, etc.)

____

Signed ____________________

Date________________ Address____________________

403 St. Paul St., W., Montreal, P. Q., Canada.
EMENTOS ANAHUAC, S. A., Carlos F. Marroquin, Technical Director, San Juan de Letran 21, 606, Mexico, D. F., Mexico.
IKKERS AND Co., G., N.V., Reclame Afdeling, Industriestraat 15, Hengelo (O), The Netherlands.
APAN SPINNERS' INSPECTING FOUNDATION, Kenji Saguchi, 1208 Imaichi-Machi, Asahi-Ku, Osaka, Japan.
A CONSOLIDADA, S. A., Victor N. Agather, Vice-President, Operations, Calzada de la Ronda 88, Mexico 2, D. F., Mexico.
ÃO PAULO ALPARGATAS S. A., Donald McQuillen, General Manager, Rua Dr. Almeida Lima 969, São Paulo, Brazil.
ARRETT, EUGENE V., Consulting Engineer, Apartado 3899, Caracas, Venezuela.
BOISO, JORGE, Technical Manager, Loma Negra Sociedad Anonima, Av. R. Saenz Pena 636, Buenos Aires, Argentina.
CALLON, R. W., Head, Analytical Div., Aluminium Laboratories, Ltd., Box 645, Arvida, P. Q., Canada.
CANADA, DEPARTMENT OF AGRICULTURE, PRAIRIE FARM REHABILITATION OFFICE, LIBRARY, 505 Canada Bldg., Saskatoon, Sask., Canada.
DREBLOW, ERNEST SAMUEL, Controller of Production, Hilger & Watts, Ltd., Hilger Div., 98 St. Pancras Way, London, N. W. 1, England.
FOURNIER, RENE, Chemist, 13 rue d'Aiguillon, Quebec, P. Q., Canada.
HERMELIN, Bo, Metallurgical Engineer, Avesta Jernverks AB (Avesta Iron and Steel Works), Avesta, Sweden.
INDIAN INSTITUTE OF TECHNOLOGY, The Librarian, Kharagpur (B.N. Ry.), West Bengal, India.
KASE, SHIGEO, Staff Researcher and Engineer, Togawa Rubber Manufactory, 29 Kohama-Nishi, Sumiyoshi, Osaka, Japan.
WORSDALE, JOHN EVERARD, Chairman and Managing Director, White's South African Portland Cement Co., Ltd., Box 2484, Johannesburg, South Africa.
YEHYA, E. MOSTAFA, Assistant Professor, Faculty of Engineering, Fuad 1st University, Guiza, Egypt. For mail: 5 Chawky St., Guiza, Egypt.

* [J] denotes Junior Member.

NECROLOGY...

The Death of the following members has been reported

C. E. BALES, President, The Ironton Fire Brick Co., Ironton, Ohio (May 26, 1951). A long-time member of the Society, his affiliation dating from 1926, Mr. Bales through the years had been very active in the work of Committee C-8 on Refractories, serving as an officer and member of numerous of its subgroups, and as Secretary of the main group from 1932 to 1936. Cecil, as he was known to his many friends in Committee C-8, will be missed especially by members of this group where he will be remembered for his jovial and cheerful spirit and for his long and faithful service on the committee work, as well as for his many useful and constructive contributions to the ceramic industry. Mr. Bales also had been an active member of Committee D-3 on Gaseous Fuels from 1935 to 1946.

ROY WINCHESTER CRUM, Director, Highway Research Board, National Research Council, Washington, D. C. (May 3, 1951). Member since 1911. (See accompanying article.)

WARREN E. EMLEY, former Chief of the Division of Fibrous and Organic Materials, National Bureau of Standards, Washington, D. C. (Residence, New Brunswick, N. J.) (June 5, 1951). Mr. Emley, who died of a heart attack at the age of 65, had retired in 1943 after many years of service with the Bureau of Standards. A member of ASTM for more than 30 years, Mr. Emley in earlier years had been very active in the work of the Society, rendering important service in many of the technical committees. He was Chairman of Committee C-11 on Gypsum from 1919 to 1926, and headed Committee D-20 on Plastics from its organization in 1937 until 1942.

RUSSELL T. FISHER, President, National Association of Cotton Manufacturers, Boston, Mass. (April 24, 1951). Member since 1922, and for many years member of Committee D-13 on Textile Materials and several of its subgroups.

JAMES A. HANCE, Consulting Engineer, Gladwyne, Pa. (May 16, 1951). Many of the older members of Committee A-1 on Steel will remember Mr. Hance as the representative for many years of Baldwin Locomotive's membership in the Society. He was very active in Committee A-1, particularly its Subcommittee on Boiler Steels.

C. F. LAUENSTEIN, Chief Metallurgist, Link-Belt Co., Indianapolis, Ind. (Died in Pennsylvania Railroad train wreck, May 18, 1951). Representative of Link-Belt company membership since 1936, Mr. Lauenstein had been an active member of Committee A-7 on Malleable-Iron Castings during the entire period, serving as Vice-Chairman from 1945 until his death, and for varying periods on certain of the subgroups including the Advisory and the Subcommittee on Pearlitic and Alloy Malleable Iron, being Chairman also of the latter group. He had represented his company also on Committee E-9 on Fatigue since 1946, and had been a member of the Ohio Valley District Council since its organization in 1949. Mr. Lauenstein held a number of U. S. and foreign patents on heat treatment and annealing of malleable and pearlitic irons and chain designs. In addition to ASTM affiliation he was a member of the Malleable Founders Society, having served as Chairman of its Technical Council, and a member of the American Society for Metals.

WILLIAM A. MCKNIGHT, Secretary-Treasurer and General Manager, Wm. F. Jobbins, Inc., Aurora, Ill. Member since 1945.

M. V. MOULTON, Manager, Pipe Line Dept., Sunset Oil Co., Los Angeles, Calif. (March 17, 1950). Member since 1935.

DAVID C. SCOTT, SR., President and Treasurer, Scott Testers, Inc., Providence, R. I. (May 12, 1951). Affiliated with ASTM since 1925, Dave Scott, Sr., as he was widely and affectionately called, particularly in the textile industry, had a leading part in the development of testing and scientific instruments used in the evaluation of textiles, wire, and many other products. He had been a loyal member of the Society and participated in many of its activities, notably in Committee D-13 on Textile Materials. He had been a member of this committee for many years and served on a number of its subgroups. He had served also for the past 25 years on Committee D-11 on Rubber and Rubber-Like Materials and several of its subcommittees. Mr. Scott was a member of several other scientific and technical organizations, and was a yachting enthusiast. He is survived by two sons, David C., Jr., and James M., both active in Scott Testers, Inc. Dave, Jr. participates in a number of ASTM technical activities and serves on the New England District Council.

ARTHUR VAN KLEECK, Chemist, U. S. Forest Products Laboratory, Madison, Wis. (May 13, 1951). A member of the Society since 1948, Mr. Van Kleeck had been active in Committee E-5 on Fire Tests of Materials and Construction, serving on the Advisory Committee and as Chairman of Subcommittee II on Fire Tests of Lumber. He had been a member also of Committee E-6 on Methods of Testing Building Constructions and its subgroup concerned with fine resistance. Associated with the Forest Products Laboratory since 1934, Mr. Van Kleeck for the past several years headed research in fireproofing treatments for wood, his work ranging from methods of fireproofing Christmas trees and decorative foliage to the use of chemicals in suppressing forest fires. Among his important research contributions was the development of several types of paints which contain chemicals that greatly reduce the spread of flame and help control fires, public patents on these formulations having been obtained by the Laboratory in his name.

EDWARD A. WILLIS, Senior Highway Engineer, Bureau of Public Roads, Washington, D. C. (May 10, 1951). A member of the Society since 1935, Mr. Willis had been very active in Committee D-18 on Soils for Engineering Purposes, serving on its advisory group and many of its subcommittees, and heading several of its research sections for varying periods. In addition to his ASTM activity he contributed extensively to the soils work of the Highway Research Board. He had been associated with the Bureau of Public Roads since 1922, except for three years during World War II when he was engaged in soil research connected with the War effort. He was author of many papers and reports on soil engineering, and in 1935 was awarded the ASTM Charles B. Dudley Medal as co-author of a paper on "Subgrade Soil Testing Methods." In the passing of Mr. Willis, the field of soil engineering has indeed lost a valuable contributor.

Notice has been received as this BULLETIN goes to press of the death of Professor Frank E. Richart at Urbana, Ill. A more extended statement will appear in the next issue.—Ed.

ROY WINCHESTER CRUM
1885–1951

In the death of Roy W. Crum, Director of the Highway Research Board, National Research Council, Washington, D. C., the Society loses one of its long-time members who, particularly in the field of concrete and concrete aggregates and road materials, contributed much to ASTM accomplishments. He was very active in several technical committees, and in other ways rendered important service to ASTM.

Following his graduation from Iowa State College, he taught for a short period, and later was Engineer of Materials and Tests for the Iowa State Highway Commission. He was in charge of the Highway Research Board, National Research Council, since 1928.

The committees in which he was most active in ASTM included C-9 on Concrete and Concrete Aggregates and D-4 on Road and Paving Materials, both of which he had served as chairman. He had been made an honorary member of Committee C-9 in 1949. Other ASTM main technical groups on which he had served for many years included Committees A-1 on Steel, A-5 on Corrosion of Iron and Steel, E-1 on Methods of Testing, and former Committee C-6 on Drain Tile. At the ti
of his death he had completed 40 years
continuous affiliation with the Society.

Mr. Crum had served on Preside
Truman's Highway Safety Conferen
He was editor of all publications releas
by the Highway Research Board and h
written numerous technical papers.
1947, he received the Iowa State Colle
Alumni Merit Award, and in 1948 t
Marston Medal for Achievement in Eng
neering. He had been active in man
professional and technical groups and h
been President of the American Concre
Institute and a Director of the America
Society of Civil Engineers.

A Scientist's Public Relations Responsibilities

In an interesting article published in *The Chemist* Leonard H. Church, Technical Director, Hill and Knowlton, Public Relations Counsel, Cleveland, Ohio, writes on "A Public Relations Man Looks at the Professional Chemist." His closing chapter headed "Responsibility" points once again to the individual responsibility of each of us in this democratic state. He intimates that "there is an over-all public relations job which must become the responsibility of all of us, if we want to see our country continue a free nation."

He refers to what was the most important public relations job ever done in our country, perhaps, as history may some day show, in the whole story of mankind. He refers to what the three expert "publicity men," Hamilton, Madison, and Jay, did in preparing their "Federalist Papers" and presenting the principles of the proposed new Constitution to the public. He notes the acrimonious debate which followed; and that finally the Constitution was approved after a long hard job. He concludes: "Today the world is filled, just as it was then, with arguments opposing the principles upon which our Constitution is built. It is time again, as it was then, to do a public relations job. In those days, this job was done chiefly by politicians, lawyers, and men of public affairs, because such men stood out as the leading people in the nation. Industry was as yet in its infancy.

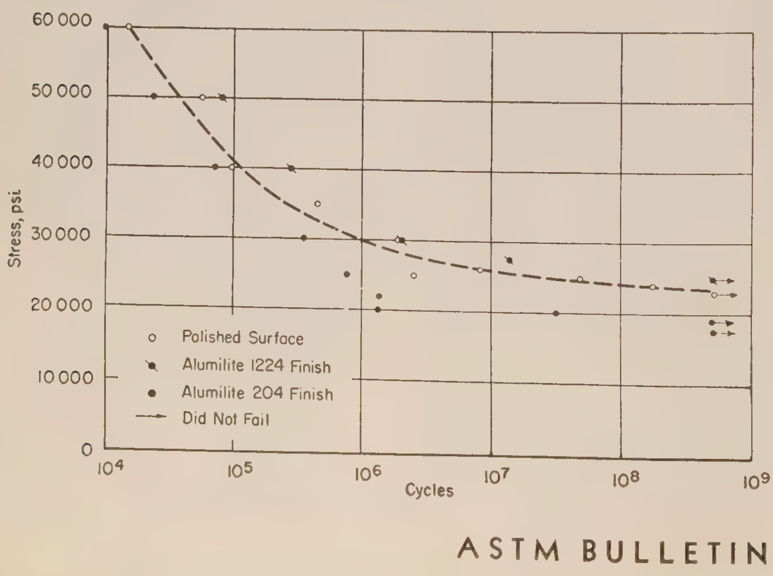
"But since that time we have built an industrial civilization. Men in industry have become key people in our economic system, and are so recognized by the public. Today, it is incumbent upon everyone to step forward, as did Hamilton, Madison, and Jay, to recite the accomplishments of his industry and his fellow scientists under a free economy, and to work aggressively for the preservation of our system of private initiative."

Testing Business for Sale

An organization in the professional testing field has indicated its desire to dispose of its business. This concern is located in one of the Rocky Mountain industrial areas. Anyone interested can write ASTM Bulletin, Box No. 10, and the communications will be forwarded.

ERRATA

On page 740 of the 1950 ASTM *Proceedings*, our printer has inserted the incorrect illustration for Fig. 9 of the paper by Stickley and Howell. It is therefore suggested that you cut out the figure below and paste it on page 740 of your *Proceedings*.



Calendar of Other Society Events

"Long" and "short" calendars will appear in alternate Bulletins. *The "short" calendar notes meetings in the few immediate weeks ahead—the "long" calendar for months ahead.*

- American Electroplaters' Society—July 30–August 2, Statler Hotel, Buffalo, N. Y.
- American Institute of Electrical Engineers—Pacific General Meeting, August 20–23, Portland, Ore.
- Illuminating Engineering Society—August 27–30, Hotel Shoreham, Washington, D. C.
- American Chemical Society—75th Anniversary Meeting, September 2–8, New York, N. Y.
- International Union of Pure and Applied Chemistry—XVIth Conference, September 10–13, New York, N. Y.
- Instrument Society of America—Sixth National Instrument Conference and Exhibit, September 10–14, Sam Houston Coliseum, Houston, Tex.
- American Institute of Chemical Engineers—September 16–19, Hotel Sheraton, Rochester, N. Y.
- American Society of Mechanical Engineers—Fall Meeting, September 25–28, Hotel Radisson, Minneapolis, Minn.
- 33rd National Metal Congress and Exposition—October 15–19, Detroit, Mich.
- American Association of Textile Chemists and Colorists—Annual Convention, October 17–19, Statler Hotel, New York, N. Y.
- National Institute of Governmental Purchasing, Inc.—Sixth Annual Conference and Products Exhibit, October 21–24, Hotel Shoreham, Washington, D. C.
- American Standards Association—Second National Standardization Conference, October 22–24, New York, N. Y.
- American Society of Civil Engineers—Annual Convention, October 22–25, New York, N. Y.
- American Institute of Electrical Engineers—Fall General Meeting, October 22–26, Hotel Cleveland, Cleveland, Ohio.
- American Institute of Physics—20th Anniversary Meeting, October 22–27, Chicago, Ill.

NEWS NOTES ON

Laboratory Supplies and Testing Equipment

Note—This information is based on literature and statements from apparatus manufacturers and laboratory supply houses.

Catalogs and Literature

Vibration Fatigue Testing—A new six-page brochure describing the eight models of vibration fatigue testing machines supplied by the All American Tool & Mfg. Co. is available from the manufacturer. Each unit is pictured and described. A separate table gives specifications for all units. The two featured units, Models 10VA and 10HA, produce vibration vertically in simple harmonic motion and horizontally in simple harmonic motion, respectively. Table load capacity ranges from 10 lb at 10 g to 100 lb at 10 g.

All American Tool & Mfg. Co., 1014 Fullerton Ave., Chicago 14, Ill.

Dynamic Testing—Alfred J. Amsler & Co. of Switzerland announces two brochures dealing with their dynamic testing equipment. One, a 20-page form, illustrates a number of applications for Amsler High Frequency Vibrophores. Illustrated are a variety of devices permitting tests such as tension, compression, alternate tension/compression (±), transverse, shear, and torsion. The other is a 12-page form describing and illustrating fully hydraulic jacks and other component parts for constructing static and dynamic testing plants. A strikingly handsome printing job has been done on both brochures. Buehler, Ltd. of 165 W. Wacker Drive, Chicago 1, Ill., is the American representative for this equipment.

Alfred J. Amsler & Co., Schaffhouse, Switzerland

Metallograph—A 20-page brochure describing the "Balphot" metallograph has been recently published by the manufacturer. The form is profusely illustrated with detail cuts of various construction features of the equipment along with detailed descriptions of individual parts. Stated as features of the instrument are: straight-line design for efficient, fatigue-free operation of controls; centerable, rotatable, ball bearing stage with mechanical stage, below eyelevel; stage elevator for speedy objective interchange without refocusing; simple, convenient interchange between binocular body and monocular tube; filters in swing mounts usable in combinations or singly with all illuminators; quick acting selector directs image to microscope, projector, or camera.

Catalog E-232, Bausch & Lomb Optical Co., Rochester, N. Y.

Optical Parts—An increasing number of inquiries for Bausch & Lomb standard optical parts for research and engineering has resulted in a new 16-page catalog called "Optical Parts" published by the firm. The catalog is expected to benefit engineers and designers by aiding them to incorporate standard optical parts into their designs, thereby avoiding the higher cost of "tailor-made" optics.

Catalog L-117, Bausch & Lomb Optical Co., Industrial Sales Dept., Rochester, N. Y.

Spectrophotometry — "Spectrochemistry—a long title for a short story" is a brief, simple description of this method of analyzing with light. It was produced to familiarize people quickly with the principles of spectrochemistry. The diagrams, in full color, were designed primarily for educational rather than sales purposes. This folder will be of value to doctors, chemists, technologists, and students interested in either clinical or industrial spectrochemistry and colorimetry.

Bulletin 50S-139, Coleman Instruments, Inc., Maywood, Ill.

Ceramic Standards for Color, Reflectance, and Gloss—A new form describing and listing ceramic color standards supplied by Henry A. Gardner Laboratory, Inc., is now available. The form announces new porcelain enamel for color standards for the Color-Difference Meter, Multipurpose Reflectometer, and other tristimulus reflectometers. The standard panels are $4\frac{1}{4}$ by $4\frac{1}{4}$ by about $\frac{5}{16}$ in. thick. Included in the form is a table showing color values of master standards for 45 deg daylight (ICI ILL. C) illumination, 0 deg viewing, computed from Beckman spectrophotometer curves.

Gardner Laboratory, Inc., Bethesda, Md.

Speed Control—The May issue of the *General Radio Experimenter* describes the improved $\frac{1}{8}$-hp "Variac" speed control for electric motors. The following are stated as features of the Type 1700-B control: ruggedness; long life and freedom from maintenance; instant starting and adjustable speed; large short-period overload capacity and ability to start heavy loads quickly; low ripple in armature circuit eliminating pulsations and permitting standard motors to be used at their full rating. Complete specifications for equipment are included.

General Radio Co., 275 Massachusetts Ave., Cambridge, Mass.

Metallograph—A very simple but compact, 12 by 12 by 18-in. high instrument that is complete with facilities for examining, studying, and photographing metal samples and other materials, even large, heavy samples, is illustrated and described in a new brochure. Shown are typical microphotographs made by the instrument of hypereutectoid steel samples at magnifications of × 400, × 1200, × 2000, and × 3400.

F. T. Griswold Mfg. Co., 305 W. Lancaster Ave., Wayne, Pa.

Turbidity Measurements—A new catalog featuring "The Turbidimeter Without Standards" has just been published by Hellige, Inc. The instrument is designed for accurate measurements of water turbidity, sulfate determinations, and measurements of suspended matter and colloids in general, but is said to be equally well adapted to many of the analytical tests commonly performed with a nephelometer. The Hellige turbidimeter eliminates preparation and renewal of standard suspensions, use of long cumbersome tubes, and the difficulty of making readings with extinction-type apparatus. Detailed descriptions of the working principle and of the instrument itself are contained in the new catalog, together with prices of calibrated and uncalibrated turbidimeters.

Hellige, Inc., 3718 Northern Blvd., Long Island City, N. Y.

Volumetric Glassware—A new booklet discussing the proper handling, care, and calibration of volumetric glassware has just been released by Kimble Glass, Div. of Owens-Illinois Glass Co., titled "The Care and Handling of Glass Volumetric Apparatus," this publication was months in preparation and contains accurate basic information for scientific and clinical laboratories and for advanced students in chemistry. A total of 16 colored figures and 6 tables describe such things as: systems of weights and measure, cleaning apparatus, reading the meniscus, gravimetric and volumetric calibration, and the drainage time of burets and pipets. The booklet is divided into four chapters.

Kimble Glass, Box 1035, Toledo 1, Ohio

Inspection Equipment—A new bulletin describing a variety of inspection equipment available from Authur S. LaPine & Co. is announced. In it is offered a wide variety of optical and illuminating equipment for inspection jobs from simple naked-eye illuminated inspection to high-power, close-tolerance microscopic examinations; black-light; fluorescent; and, around-the-corner inspection of the inaccessible or the out of view.

Arthur S. LaPine & Co., 121 W. Hubbard St., Chicago, Ill.

X-Ray Spectrometer—A new form published by the Minneapolis-Honeywell Regulator Co. describes the use of that firm's equipment in connection with the x-ray spectrometer manufactured by the North American Philips Co., Inc., of New York. The instrument, designed principally for x-ray diffraction work and fluorescence analysis, features fully automatic recording. Various sections of the data sheet are entitled Applicability, Components Required, Fundamental Operating Principles, Scanning, Automatic Recording, and Design Features. Also included is an analysis of a typical x-ray diffraction pattern recording with the new instrument.

Instrumentation Data Sheet No. 10.16-1, Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa.

Laboratory Supplies—A new type laboratory supply catalog of 896 pages has just been published by the New York

Laboratory Supply Co. This catalog incorporates a new, easy-to-use form. This new method of listing assigns a separate boldface catalog number of each size and style of a particular item, omitting all chances of errors in ordering by the purchaser; also eliminates lengthy descriptions of the particular item formerly needed to ensure proper delivery. Now, all that is needed is one 5-digit number. A single column format has been used throughout this volume affording a maximum of white space and at the same time placing the illustration adjacent to its description. Over 3500 illustrations are used. This catalog has a sewn binding and is cased in a durable hard cover. While this catalog is being offered free of charge, the supplier does require that all requests be submitted on official company or institutional letterhead, and signed by a person of responsible position, plus his or her title.

Catalog Dept., New York Laboratory Supply Co., Inc., 76 Varick St., New York, N. Y.

Automatic Voltage Regulators—The Superior Electric Co., manufacturers of voltage control equipment, has released a new 12-page bulletin featuring the complete line of standard automatic voltage regulators. This new bulletin describes in detail the workings of a unit in maintaining a constant output voltage regardless of fluctuations in a-c input line voltages and changes in output load. All standard models of both the type IE and the type EM are discussed. The bulletin illustrates each standard unit togther with outline drawings and performance data. A complete rating chart on the back cover provides engineering information for ease in selecting a unit for specific application.

Bulletin S351, The Superior Electric Co., Bristol, Conn.

Portable Glossmeter—An improved portable glossmeter is announced by the Henry A. Gardner Laboratory, Inc. Stated as features of the new instrument are the following: new optical design reduces calibration failures; new lamp reduces burn-outs; new Cole-Hersee prefocus socket permits easy and exact lamp replacement; new "easy-to-carry" case keeps apparatus together and clean when not in use; new "mount-on-door" model takes panels on top; new experimenal 20-deg unit for high-gloss surfaces, and 45-deg unit for ceramic materials now available. The instrument is described and illustrated fully in a new piece of literature available from the firm. Of particular interest to ASTM members will be the fact that the literature describes the historical development of ASTM Method D 523 for 60-deg gloss.

Gardner Laboratory, Inc., Bethesda, Md.

Instrument Notes

12,000 Universal Testing Machine—An improved, low-cost universal testing machine of 12,000 lb capacity is announced by Baldwin-Lima-Hamilton. The new Model 12-H, like the 60-H announced more than a year ago, has many of the features of larger Baldwin testing machines. One is that the hydraulic loading unit is separate from the indicating and control unit, which isolates recoil from breaking test specimens and permits adjusting maximum or lazy hands with minimum drag. The rigid, two-column design with $9\frac{1}{2}$ in. of clear lateral space between columns gives high accessibility in handling specimens and simplifies observations. Load (either in tension or compression) is applied upward by an integrated piston and elevating cage consisting of the table, two uprights, and upper gripping head, all of which have an 8-in. stroke. Loading speed can be varied infinitely between 0 and 10 in. per minute.

Baldwin-Lima-Hamilton Corp., Paschall Station P.O., Philadelphia 42, Pa.

Ultrasonic Tester—A portable ultrasonic detector, expected to find many industrial applications, has been announced. Developed originally for testing railroad rail in track, the instrument can also be used to test certain other steel and aluminum parts with uniform cross-sections. The instrument, called the "Audigage Flaw Detector," detects hidden defects invisible from the top of the rail in critical locations such as the area within joint-bar limits, switches, tunnels, grade crossings, etc. Ultrasonic resonance is employed to generate a tone in the headphones worn by the operator. A perfect rail causes resonance at a frequency reflected in a 1000-cps tone in the head phones; the presence of a crack or other flaw is revealed by a distinct change in the pitch of the audible signal.

Branson Instruments, Inc., 430 Fairfield Ave., Stamford, Conn.

Polarograph—Patwin Instruments division of The Patent Button Co. announces a new instrument for polarography. The instrument may be used for both research and routine analysis of chemical compounds. A typical industrial application would be in the rubber industry where the presence of lead or zinc in rubber compounds could be determined. Stated as an outstanding feature is a built-in standard cell which allows accuracy of the instrument to be checked while in use. Simplicity and ease of operation are also featured.

General Scientific Equipment Co., Hamden, Conn.

Contour Measurement—By utilizing a beam of light as a straight-line reference, deviations of supposedly flat surfaces, as small as plus or minus 0.00005 in., are said to be measured by a new instrument called the "Griswold Huet Optical Straightedge" which consists of a lens and prism housing and a feeler microscope with built-in illumination which rides along the surface under examination. The errors, observed through the microscope, are indicated by the relative position of two indices. Deviations, enlarged by 1000, are traced for permanent record on coordinate paper as the feeler is moved from one end of the housing to the other.

F. T. Griswold Mfg. Co., 305 W. Lancaster Ave., Wayne, Pa.

Stroboscope—The "Kern Super-Stroboscope," recently announced, is said to make possible the observation and photographing of rapidly occurring phenomena of a periodic, and more particularly of an aperiodic nature. The principle of the instrument consists in optical investigation by means of a slotted stroboscopic disk and a rotating mirror. Before it reaches the slotted disk, the light from the object, which is limited by a slit, is directed by a fixed mirror to a mirror drum, which is coupled to the spindle that drives the disk. The images of the object, which are visible through consecutive slots, are thus laid out side by side at regular intervals by the mirror drum, permitting minute analysis of the movement under observation.

Lovins Engineering Co., 8203 Cedar St., Silver Spring, Md.

Hardness Testing Machine—A newly designed Brinell Hardness Testing Machine which features a throat depth of 24 in. is announced by Steel City Testing Machines, Inc. Made especially for a leading producer of armor plate, this hydraulically operated unit is also adaptable to the requirements of other manufacturers who need a deep-throated hardness tester. Designated Model AP-1, this C-frame machine incorporates several unusual features. It is mounted on wheels so that it can be rolled out of the way when not in use and then easily rolled into position, reaching out over a conveyor. The lower anvil is the top of a hydraulic piston which rises as the load is applied to take the pressure off the conveyor. This also tends to keep the armor plate level while the test is being made. Machines are made to order so that anvil height will conform to customer's conveyor height. The maximum vertical opening between ball penetrator and anvil is 4 in.

Steel City Testing Machines, Inc., 884[illegible] Livernois, Detroit, Mich.

INSTRUMENT COMPANY NEWS . . . .

Announcements, changes in personnel, new plants and locations, and other notes of interest

General Instruments, Inc. Announcement is made of the formation of General Instruments, Inc., 6000 Lemmon Ave., Dallas 9, Tex., to assume all research, development, and manufacturing operations heretofore performed by the Laboratory and Manufacturing Division of Geophysical Service, Inc., and to expand activities in the field of electromechanical instruments for use in industry and defense. Geophysical Service, Inc., will continue without change its service to clients throughout the world as a contractor in geophysical exploration for oil.

The Macbeth Corp., Newburgh, N. Y., manufacturers of pH meters, photometers, optical instruments, and color matching lights announce the acquisition of a second plant in Newburgh, N. Y., for the manufacture of optical and electronic instruments. This represents a doubling of present manufacturing and research facilities and a fourfold increase in its plant size since the Macbeth Corp. moved to its present site from New York City early in 1950. The new plant will be in operation about June first of this year.

Carl Schleicher & Schuell Co., manufacturers of filter papers for use in chemical analyses, biological procedures, and in plant processing work, announce the removal of their offices, plant, and laboratories to Keene, N.H.

"An Idea Whose Time Had Come"

Annual Address by the President, L. J. Markwardt,[1] June 19, 1951

Victor Hugo once said, "No army is as powerful as an idea whose time has come."

When the ASTM was organized some 50 years ago, it was predestined to be "an idea whose time had come." Conceived as a medium for promoting knowledge of materials, for developing specifications for materials, and for standardizing methods of test, the idea fell on fertile soil at the beginning of a new era. That the ASTM has become of age, with a membership now past the 7000 mark, and with some 1800 standards comprising six volumes of 8500 pages, is now history. It is interesting to review the conditions and the principles that have enabled the Society to assume its significant and pre-eminent place in the national economy, and to appraise the tenets that must serve as a guide to an even more important role in the future.

At the turn of the century, when the ASTM was founded, the foundations had only recently been laid for our great industrial expansion and development. The pioneering era—with its need of individual self-sufficiency—had come to a close. The invention of the reaper—and other mechanized equipment—was already on its way to improve the efficiency of agriculture and industry, to reduce almost completely the drudgery and limitations of hand operations, and to set the stage for unprecedented mass production.

Basic Factors in American Development

America was eminently fortunate in having a wealth of natural resources and conditions to invite development—fertile lands and prairies; the finest stands of virgin forests the world had ever known; abundant waters and streams; invaluable iron ore and other varied mineral deposits; rich coal and oil resources and not last or least, a temperate, varied, stimulating, and healthful climate favorable to agriculture and to human achievement. Among other elements present in the American formula for progress were the indomitable spirit of the composite population; a system of government based on freedom of thought that fostered free enterprise, with due reward for initiative and incentive. There was also a recognition of the value of standardization and the techniques of mass production.

Today's America

As nations go, our country is still very young. One hundred seventy-five years ago we were a struggling group of colonies with a population of about 2,500,000. By 1900, we had grown to 76,000,000. Today we find ourselves the strongest, most prosperous nation in the world, with the highest standard of living ever known. We have only 6 per cent of the world's land and 7 per cent of the world's population. This 7 per cent owns 72 per cent of the world's automobiles, 50 per cent of the world's radios and telephones. This 7 per cent uses half of the world's rubber and coffee, two thirds of the world's oil and silk, and produces 34 per cent of the world's meat and 47 per cent of all manufactured goods in the world. This is the record made by the American free enterprise system, with the benefits of the abundant natural resources.

Challenge of the Future

Just as we of this generation have inherited the America of yesterday, so today's America, with all its developments and resources, must inevitably be taken over by the younger generation. Someone has said: "What our forefathers have bequeathed to us, we must earn to possess." What is done to earn this heritage will determine in large measure the future of America.

One virtue that would not come amiss is modesty. It is not to be unexpected that a wealth of production of consumer goods, and an unprecedented standard of living

with innumerable labor-saving devices, may invite envy. There is an old proverb that great prosperty and modesty seldom go together. Prosperity needs no apology, but the need has been suggested for employing wisdom and discretion, generosity, and grace in dealing with this heritage. This is significant also because it is difficult to recount the many luxuries now regarded as essentials without the appearance of boasting. An old couplet may be apropos:

"To earn respect, and not dismay.
Boast only in silence, without display."

The challenge of the future is naturally the preservation and further development of those basic factors that have comprised the essential ingredients in the formula of American economy and way of life:

- The courage, energy, resourcefulness, imagination, and spirit of its people—
- the system of government that permits great individual freedom—
- the incentive motive—
- the conservation of natural resources, and
- the benefits of standardization and mass production.

To earn this heritage we must guard the American formula and protect it from enemies both within and without. The system is not perfect—no system is perfect—it

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has weaknesses that require continued changes and repair. In other words, we cannot take this system and this freedom as a matter of course, or we shall lose it. We must continue to be willing to earn it by fighting for it. A great nation dare not become static. It must either move forward or decline. And we are reminded by Oliver Goldsmith that even wealthy countries may decline, when he says:

"Ill fares the land to hastening ills a prey.
Where wealth accumulates and men decay."

Role of the Incentive Motive

While all the basic elements in the formula for progress are important, it may be appropriate to single out a few for special comment. Among these the significance of the incentive motive cannot be overemphasized.

Incentive thrives on opportunity. The stimulation of achievement by reward provides incentive, and with incentive much can be accomplished individually and collectively. Remove the incentive motive and progress is at once retarded if not stalemated.

The Amana Community:

Located in Iowa, in a charming valley from which the surrounding hills recede like the steps of a Greek Theater, is the Amana community. Seven old-fashioned villages nestle on the hillsides, surrounded by some 26,000 acres of fertile farmland.

Amana was founded nearly a century ago. Much has been written about it. Its history gives an interesting example of the importance of the incentive motive even in a communal enterprise. The story in brief, as abstracted from *Fortune* (December, 1949), is as follows:

"How would they set up the community? ...Henceforth, no one would have more than anyone else; the land, they agreed, would 'remain a common estate and property...as also with all the labor, cares...and burdens, of which each member shall bear his alloted share with a willing heart.' Control, spiritual and temporal, would rest with thirteen trustees....

"The fruit of their labors they turned over to the common storehouse, and though one might produce more than another, all were rewarded equally.... Soon the new community was prospering.... Year after year prosperity continued.

"Somehow it happened.... As third generation succeeded second, skepticism set in; there was more grumbling and discontent, and the idealism...began to disappear.... Once again the world had intruded.... 'World clothes' appeared in Amana closets. Musical instruments were smuggled in. A trustee bought a car. Without the old spirit to guide them, they became more occupied with their benefits than with the common effort that provided them. Many grew slothful in their work....

"Each year productivity declined more rapidly. Fixed charges, however, remained the same, and in the twenties, for the first time in Amana history, red ink crept into the colony's books. By 1929 the surplus had almost vanished, and when the depression came to send farm prices plummeting, annual deficits began mounting disastrously. By 1931 they reached $500,000, and for the trustees catastrophe could no longer be ignored. The colony was about to go bankrupt.

"What to do. Shocked out of their lethargy, the members selected a committee of forty-seven to study the situation. After months of debate and emergency town meetings, the committee came up with its recommendation. It was drastic...and on February 1, 1932, by a nine to one margin, the members voted a new constitution. Two months later...the new era began. Amana had gone capitalistic.

"Under the new constitution, religious and temporal authority were separated and the society set up a sort of stock cooperative. Land, buildings, livestock, and all other assets were appraised at $2,200,000, and with this as net capital a corporation was formed.... There were still some benefits...but for basic necessities members were on their own. With the passing of the communal kitchens, food was no longer free. Neither was shelter, and in exchange for stock, members could now become owners of the houses they lived in. Similarly, cobblers, tailors, and the like were urged to buy their shops, and set up as independent businessmen. For those who worked in the fields and mills, time clocks and pay checks were introduced....

"The effect was outstanding. Doubly spurred, because they were now both stockholders and wage earners, members fell to working harder.... Within a few months productivity had so risen that 200 outside workers could be discharged....

"From approximately $400,000 in 1932, total sales jumped to $727,000 in 1933. By 1942 they were up to $1,664,500; by 1948 to $7,058,500. The recession notwithstanding, business has continued as brisk as ever.... All in all, the society estimates, sales should reach $7,000,000. Being good capitalist businessmen, they wouldn't mind doing even better next year."

Role of Conservation of Resources

One of the most important factors in the development of the American economy to heights never before dreamed of has been the extensive basic resources with which the country was endowed. This economy did not develop in an exhausted country. The abundance of natural resources provides the basis for an abundant economy.

Our country has a high spiritual destiny—but a destiny that can only be realized if we guard these invaluable basic resources that make for the abundant economy. It is axiomatic, therefore, that our wealth of natural resources should not be used injudiciously, but rather the public and posterity have a right to expect their development to the best interests of the country, in so far as this can be done within the economic limitations prevailing.

In a talk before the Isaac Walton League at its last annual meeting, Dr. J. Alfred Hall presented a timely and effective commentary on the subject of conservation.

He points out that the system of free economic enterprise that we cherish, and is the most important part of our life, has within it the most important dangers to our way of life. Says Dr. Hall:

"Let's examine them a minute. Understand that under a system of unregulated free enterprise we have to do a few things. We have to mine the coal first that is closest to the top of the ground and of the best quality. Up in Minnesota we had to take out the best iron ore first. We had to cut the trees that were easiest to get out along Puget Sound. The biggest trees. We got rid of them first. We cleared the best agricultural ground. Then we wasted an awful lot of that. All the way through our whole fabric our system compels us to take the best first, and unfortunately it has so far compelled us to liquidate it rather rapidly. Now, the base of our life, as I see it, is an abundance of easily available rich natural resources, and this concomitant of our

freedom, a system of free economic enterprise, tends to destroy that base. It can only live upon that base, but it tends to destroy it.

"I think the medical profession has the term 'self-limiting disease.' This might be self-limiting, if we continue along the road that we have followed so far.

"All right, what do we do about it? There are two or three ways of going at it. One is the authoritarian way which none of us would want. Oh, sure, pass a law! Pass a law! I hear that so many times. You cannot do anything with law in this country unless it is supported by the main body of public opinion. No law can get anywhere unless we support it because we are the government and what we say goes. So unless you have a kind of government that you and I don't want, even to think about it is not going to amount to anything.

"What is the alternative? Let her go. Well, you know what the alternative to let her go is. We have been letting her go for three hundred years. High, wide, and handsome. Come and get her. Pie in the sky! Free for everybody! That has been our philosophy and it has been a grand picnic for a lot of folks. But as you look down over the horizon a little you don't have to be an all-wise man to see that those things come to an end.

"What are we doing? We are getting ready to work lower grade iron ore. We are working lower grade aluminum. We are going farther and farther afield to get our coal. There is still a lot of coal, thank heaven. We are not going to run out of it. You know the forest situation as well as I do. A lot of these basic resources—copper. Well, you know the copper story. We are already short a lot of things, and if we fight another war—a big one this one will be—we will pour out a tremendous lot of treasures, a tremendous lot of our resources. We will come out of it military victors but we will lose a lot of our resources base, and as we lose our resources base we lose a part of our liberty just as surely as if we were invaded and conquered by an alien enemy.

"Get that into our heads and I think we can lick this thing. We lose our liberty as we lose our stuff. Communism does not develop in countries like ours. Communism develops in countries where people have nothing to hope for.

"In the meantime, we have our job to do. So there is only one alternative that I see. That is an awakened moral conscience on the part of the people. That will give form and direction to this positive philosophy of the conservation of the base of our way of life."

No doubt most Americans agree with Dr. Hall that control by regulation and legislation should be kept to a minimum. It is abuses that often prompt legislation enacted in the public interest to protect our natural resources. Familiar examples are those relating to stream pollution, which tends to become more important with increasing population and increasing industrial development, to fisheries and to game.

Our challenge is the acceptance of the obligation of the conservation of resources by wise use, and the exercise of what may be called "self control" in the public interest, or "an awakened moral conscience on the part of the people."

Conservation and the ASTM:

We do not think of the ASTM primarily as a conservation organization, yet in its broader sense it is working extensively in this field. The establishment of standard methods of test for the evaluation of the properties of materials is an important factor in their efficient use, and the obtaining of reliable data also facilitates the making of substitutions when necessary. The many ASTM specifications for materials and products establish maintenance of quality or performance, at a known level through proper control. These materials and products can accordingly be used more efficiently and economically, and more definite or lower factors of safety can be employed. Through the ASTM procedure, these specifications are adopted voluntarily and serve in the public interest. They contribute materially to better economical utilization of our material resources, and afford in a concrete way, an illustration of the significant role of the ASTM in conservation.

Role of Standardization and Materials Specifications

Another important factor in American industrial development inviting special comment is the role of standardization and material specifications.

Standardization, particularly as it relates to quality and mass production, relatively speaking is a modern idea. In the handicraft era, it was unknown, or at most was no more than a dream.

Seventeenth Century Standardization:

Because of the premium for superior achievement, it is not surprising to find that thoughts of standardization were expressed at least as far back as three centuries ago, during the romantic days of iron-clad knights and their trusty steeds. The situation existing at that time led to the appointment of a commission by Charles I, that reported in 1631 on the need of standardizing armor, guns, pikes, and bandaliers, as follows:

> "And because we are credibly given to understand that the often and continual altering and changing of the fashion of armes and armours, some countrys and parts of the Kingdome having armours of one fashion, and some of another, do put many of our subjects to a great and unnecessary charge, and more than need requireth for the avoiding whereof, our will and pleasure is, and we do hereby appoint and command, that hereafter there shall be but one uniform fashion of armours of the same common and trayned bands throughout our said Kingdome of England and domynion of Wales, when as any of the said armours shall be supplied and new made, and that form and fashion of armour shall be agreeable to the last and modern fashion lately set down and appoynted to be used by the lords and others of our Council of Warre (the patterns, whereof are now and shall remayn in the office of our ordinance from tyme to tyme, which is our pleasure likewise concerning gunnes, pikes, and bandaliers whereof patterns are and shall remayn from tyme to tyme in our said office)."

Early Developments of Interchangeability of Parts:

However, it was not until 1801 that the first real example of the interchangeability of parts was demonstrated by the versatile Eli Whitney. In the book, "Masters of Mass Production," it is reported that he had accepted an order of 10,000 muskets from the War Department on March 1, 1799, with a time limit of 2 years for completion. At the end of the first year he had completed only 500 guns. He had become so engrossed in developing methods of production that his order was far from filled when the contract expired. Something needed to be done, so Eli Whitney

brought a box to the War Department in Washington that he said held 10 muskets. When opened, it held no muskets, but a jumble of barrels, stocks, triggers, locks, and other parts. He asked an ordance expert to pick out a set of parts and lay them together. Quickly he converted the pile into a finished gun and continued the process until there were 10 guns. Nothing like that had ever happened on this planet before.

Need for standard specifications for quality and uniformity of product, and the development of methods of test, has come with the era of the industrial revolution. It is in these latter fields that the ASTM has played an all-important part.

Methods of Establishing Standards and Specifications

There are obviously a number of ways in which standards and specifications may be established—by government, by producers, and by voluntary multilateral agreement among producers, consumers, and general interests. It is by the voluntary action method that agencies such as the ASTM operate.

It has recently been pointed out by Mr. Lowell B. Mason of the Federal Trade Commission (*Standardization*, January, 1951), that there has been some fear that the adoption of standards, and presumably also of specifications, by industry groups may be regarded in some economic circles as "Conscious Parallel Action" that should be prohibited.

To emphasize the complications and disadvantages of not having standards, he describes an imaginative place, not far from the shores of America where it can be easily visited, that he calls "Non Parallelia." It is a show place, where one can go and observe the limitations of its strange obsession—for in Non Parallelia all standardization is barred. Says Mr. Mason:

"In Non Parallelia there would be no organized efforts devoted to the educational and scientific aspects of the standardization of measurements, materials, products, methods, operations, and nomenclature, in industrial production and distribution.

"In Non Parallelia, if a man wanted to make bolts and nuts with threads $\frac{37}{91}$ of an inch wide, he would not have huge and powerful consumer groups pressuring him to make $\frac{3}{16}$-in. bolts instead. In fact, in Non Parallelia we would require all men to make their products just a little different in size from everybody else.

"This idea that railroad tracks, as well as thousands of other items in constant and general daily use, should be the same width is a vicious product of the American way of life and leads to what, in some Government economic circles, is known as 'Conscious Parallel Action.'

"In Non Parallelia there will be no dull repetitive existence such as the American householder and his wife now have.

"Take for instance the insignificant, but quite important operation known as watering the grass. Here in America, every man's hose coupling is the same size.

"Walk up and down the residential streets of our cities; knock on every door; and you will find the same drab similarity in lawn faucets.

"There is nothing in American lawn tending that sets one man apart from his less successful neighbors.

"When it comes to watering the grass, we have no men of distinction.

"Non Parallelia will not use the interchangeable thread system developed under the auspices of the American Standards Association in conjunction with the British and Canadians.

"Think what a boon it would be to live in a country where you definitely know your neighbor will not come over to your house to borrow your hose because it wouldn't fit anyway. Probably your hose will not even fit your own faucet. But that will only make watering the lawn a thrilling adventure rather than a routine.

"In Non Parallelia we are going to have all industrial problems worked out by Government bureaucrats who do not know anything about Dimensional Coordination, Combined Specifications for Materials and Installation Work, Tensile Strength of Hydraulic Cement Mortars, Identification of Piping Systems, Ductility of Bituminous Materials, Sieve Analysis of Mineral Filler, Weather Resistant Saturants, Cupola Malleable Iron Specifications, and the Photographic Exposure Computer.

"Because we bureaucrats do not know anything about these things we will be able to bring a fresh outlook to the world.... We would not allow the Modular principle in building construction; we reject the engineering approach and substitute the political approach. Mandatory construction details will be the order of the day instead of performance requirements. This will effectively check any encouragement of production of improved materials and processes.

"You may not want to live in Non Parallelia. Frankly, I wouldn't care to either."

Non Utopia

We all know that in America today specifications for materials and products are indispensable, and we recognize the important part the ASTM plays in their development. Have you ever considered what an industrial nation would be like without them?

Let us consider for a moment we are in an imaginary country that has no specifications. This country would be called Non Utopia and logically would be located near Non Parallelia.

Since there are no specifications, each industry is free to operate independently, with no responsibility to consumers or the public. Its joint mottos, one learns, are "*Laissez nous faire seules*" and "*Caveat emptor.*" ("Let us act for ourselves" and "Let the buyer beware.")

Such things as dimensions and sizes are standardized, but without specifications there are obviously no standards of quality. Various products are hence made and sold without regard to grading or quality standards. Naturally a wide range in performance of products and materials may be expected. But that is not the producer's concern, for after all is not the buyer responsible for what he purchases, is not quality mainly for the consumer's convenience, assurance, and benefit?

In Non Utopia the simple matter of watering the lawn at times becomes a gay experience. With perfect size standardization, your neighbor's hose is, of course, sure to fit your faucet installation. However, after attaching your borrowed hose and sprinkler, you find your neighbor has been a little careless in his purchase. Immediately after turning on the water, you discover a sizable leak in the hose. You don't mind being sprayed, because after all, are you not watering the lawn as well? You, of course, find it easy to repair the hose with tape, after which you again turn on the water. Much to your surprise the increased

pressure causes another leak. And so the gay adventure continues.

Non Utopia is relatively new, but misgivings are already being heard as to its future. Illustrative of these misgivings are reports that railroad accidents have reached alarming proportions due to faulty materials; that the airlines have been forced to suspend operations pending inspection of the planes; that serviceability of some products is extremely low, with increasingly high replacement costs; and that homes built as lifetime investments are deteriorating in unpredictably short periods before installment payments are completed. Conditions have reached such a state that remedial measures must be taken. It is learned that a mission has been sent to America to study its specification system, including methods of preparation.

The cartoon is an effective device to highlight by exaggeration some particular point. This word cartoon of exaggeration of Non Utopia, of course, has no part in fact. To paraphrase the movies, "The presentation is purely fictional, and no resemblance to any individual or company living or dead is implied or intended."

What is intended, however, is to emphasize by contrast the method of self-control in the free enterprise system, and particularly what constitutes the "Keystone" of the ASTM way, namely, its formula for technical committee structure in the development of standard specifications and methods of test, with a balance of all interested parties, producers, consumers, and general interests. What success the ASTM has had in the general acceptance of its methods and specifications stems from this sound concept of providing a medium for give and take among all parties concerned. To an even greater extent, it is the solid foundation for its expanding future development.

The ASTM Challenge of the Future

It has been previously mentioned, in connection with our national economy, that "What our forefathers have bequeathed to us, we must earn to possess." As I see it, this thought is equally applicable to the ASTM. It means that achievement must not be taken for granted; that there is never time to rest on our oars; that we must continue to be alert in keeping up with advances in technological progress; that we must explore new fields of endeavor whenever their need is indicated; that we must actively continue research, one aspect of which is that necessary sifting and winnowing by which alone the truth can be found; that we must continue to survey our committee structure, without fear of discontinuing some line of endeavor that has been outmoded; that we must protect the formula for technical committee structure through the full representation and required balance of all interested parties, producers, consumers, and general interests; and that we must continue to grow.

These observations are self-evident; I do not need to add that we must continue to work, because I know the ASTM will continue to do that. I believe it is one of the most, if not the most industrious and productive technical associations in the country. I know you will keep it so.

Those of you who enjoy the vigor of outdoor life and reflect on the rigors of pioneering in a rugged land, are no doubt familiar with Robert Service's vivid description of the Gold Rush Country in his "The Spell of the Yukon." Do you recall how it goes:

"I wanted the gold, and I sought it;
I scrabbled and mucked like a slave.
Was it famine or scurvy—I fought it;
I hurled my youth into a grave.
I wanted the gold, and I got it—
Came out with a fortune last fall, —
Yet somehow life's not what I thought it,
And somehow the gold isn't all.

"No! There's the land. (Have you seen it?)
It's the cussedest land that I know,
From the big, dizzy mountains that screen it
To the deep, deathlike valleys below.
Some say God was tired when He made it;
Some say it's a fine land to shun;
Maybe; but there's some as would trade it
For no land on earth—and I'm one."

With apologies to Robert Service, someone has paraphrased a conception of the spirit of the ASTM:

"Yes, there's the ASTM, have you seen it?
It's the busiest group that I know,
From the officers and staff that serve it,
To the active committees below.
We salute those whose effort has made it,
Who knew work was no thing to shun,
And I'm sure there's many would trade it,
For no group on earth, and I'm one."

In Conclusion

In conclusion, with this annual meeting, I must relinquish the high office with which you have honored me and retire to the status of past-president. I have appreciated and enjoyed being president of an organization that is so important to the well-being of our nation, but presidents must step aside when the time comes, and make way for new men and new ideas. I do not expect to "fade away," for the ASTM has a way of keeping past-presidents busy. I expect to keep my technical committee activities, and hope to continue the fine association this work has brought about.

I realize that my big moment has passed. I am comforted, however, by Arthur Guiterman's lines on "The Vanity of Earthly Greatness":

"The tusks that clashed in mighty brawls
Of mastodons are billiard balls.
The sword of Charlemagne the Just
Is ferric oxide—known as rust.
The grizzly bear, whose potent hug
Was feared by all, is now a rug.
Great Caesar's bust is on my shelf,
And I don't feel so well myself.

Reprints of this address, in 6 by 9-in. page size format, with cover, are to be available. Copies will be sent without charge on request.

Electrically Excited Resonant-Type Fatigue Testing Equipment*

By Thomas J. Dolan[1]

SYNOPSIS

A new fatigue testing machine is described that is operated and controlled by simple electrical circuits. The majority of the electrical components employed are of standard commercially available equipment. The loads are applied by inertia forces from two heavy masses between which is suspended the test specimen. The system operates as a "tuning fork" which subjects the test specimen to vibratory bending stresses; it is automatically excited electronically in resonance with the natural frequency of the assembly (usually 40 to 100 cps). The difficulty of controlling the amplitude of the resonant vibration within narrow limits has been solved satisfactorily by employing a new and relatively simple circuit actuated from a micrometer screw that is used to pre-set the amplitude desired. Several unique design features have been developed and incorporated into the control and shut-off mechanisms on the machine that are also applicable to exciting and controlling vibrations in simulated service testing. Advantages and adaptability of the equipment for other uses are discussed briefly. Preliminary results are presented from flexural fatigue tests of round and of square specimens of 24S-T4 aluminum alloy to show the effect of shape of cross-section on the fatigue strength.

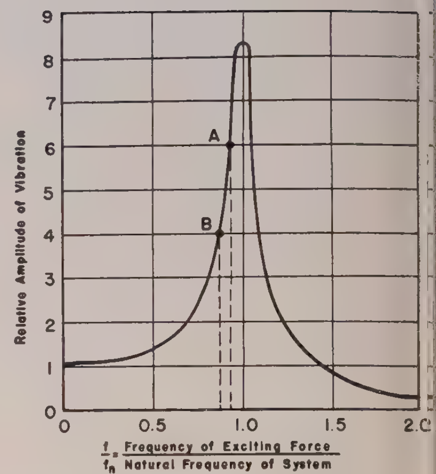

Fig. 1.—Resonance Diagram.

A WIDE variety of fatigue testing equipment has been devised to produce various types of repeated stressing by means of mechanical, electrical, hydraulic, or pneumatic loading systems (**1**).[2] In some instances it has been found convenient to employ a vibrating system operating at or near the resonant frequency and thus use the inertia of moving masses to develop the alternating loads. Inertia loading is of particular advantage in tests of large specimens since it minimizes the magnitudes of the external forces which must be applied (and relatively high frequency of stressing can be developed) to rupture large-sized fatigue specimens. When operating at resonance, the exciting forces supplied to the system are only a small proportion of the magnitude of the forces exerted on the test specimen.

For certain applications in which specimens of noncircular cross-section are to be tested, it is convenient to employ a flexural fatigue test in which the specimen is nonrotating; that is, the specimen is repeatedly bent in one plane by means of alternating moments applied at its ends. Several such machines have been built by different investigators in which a specimen is vibrated at or *near* resonance by means of exciting forces furnished by an alternating magnetic field (**2**), by a mechanical oscillator, or even by a tuned air column (**3**). In other instances (**4, 5**), heavy masses have been attached to the ends of a specimen to enable the testing of larger specimens in bending or torsion with similar methods of excitation. However, most of these systems operate on the steep slope of the resonance curve (just above or just below the resonant frequency, $f/f_n = 1$, Fig. 1) and control of the amplitude becomes a very difficult problem. Extremely small changes in frequency of the exciting force result in very large changes in amplitude of vibration of the system (as from A to B in Fig. 1).

In order to utilize the advantage of testing with small exciting forces, equipment has been developed incorporating a method of excitation by means of a

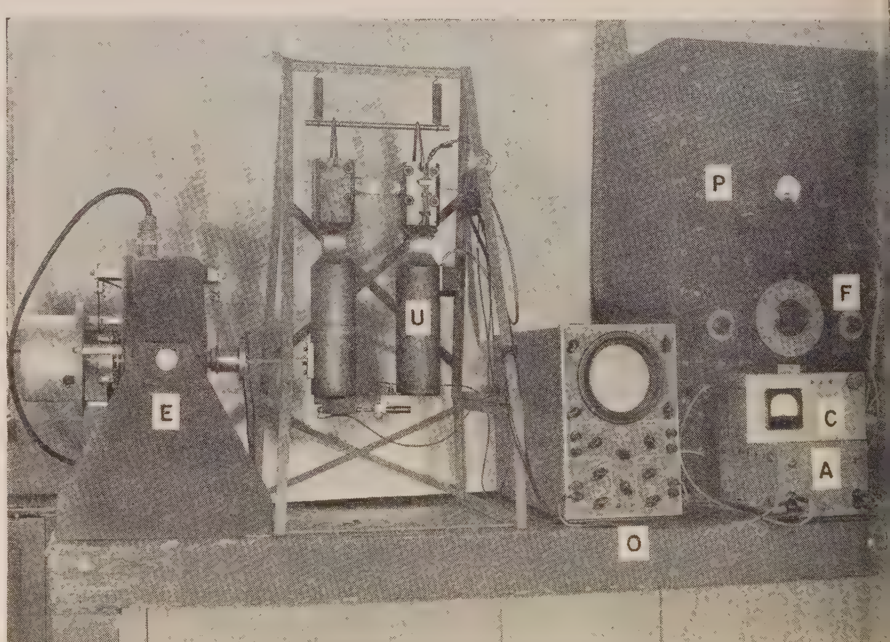

Fig. 2.—General View of Machine and Electrical Equipment.

U—"tuning fork" assembly
E—electrodynamic exciter
C—control circuit
A—voltage amplifier
P—power amplifier
F—audio-frequency oscillator
O—cathode-ray oscilloscope

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

* Presented at the Fifty-fourth Annual Meeting of the Society, June 18–22, 1951.

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[2] The boldface numbers in parentheses refer to the list of references appended to this paper.

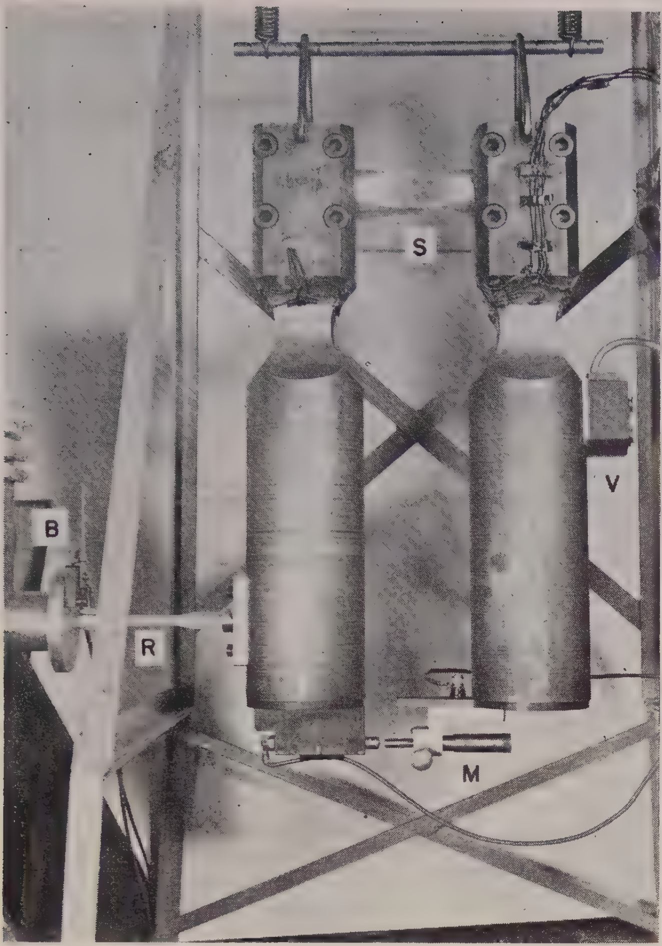

Fig. 3.—U-Frame Assembly and Exciter.

S—specimen
M—micrometer screw adjustment
R—drive rod from exciter
V—velocity pickup
B—beam mechanism for shutting off machine

simple electrical circuit which automatically keeps the system in resonance at all times. The development of a stable control circuit for automatic correction of amplitude was necessary to make operation of the machine feasible and accurate. Electric resistance strain gages have also been included in the system for purposes of checking the bending moments developed while the specimen is being stressed.

This machine, shown in Figs. 2 and 3, was originally developed for use in investigating the changes in flexural fatigue strength produced by altering the shape of cross-section of specimens approximately 1 in. in depth. It operates essentially as an electrically excited "tuning fork" in which the amplitude can be pre-set and is automatically stabilized. The same type of operating system can readily be applied to the testing of very large specimens or to the control of vibrations of structures in simulated service testing of members such as airplane wings or propellers. It also offers advantages in making possible studies of changes in damping and stiffness characteristics of the specimen during testing.

This paper is presented for the purpose of describing the principal details of the operating circuits and the control and shut-off mechanisms incorporated in the equipment. It is believed that these will be useful not only in connection with design of fatigue machines, but also in other types of equipment requiring close control of a vibrating system.

Description of New Testing Machine

The portion of the apparatus shown in Figs. 3 and 4 consists of a "tuning fork" (similar to that used by Gadd (**4**)) comprising an inverted U-frame, the vertical members of which are formed by two heavy steel masses and the horizontal member by the test specimen. This assembly is suspended by links and soft springs from a frame which allows free vibration of the assembly as a "tuning fork" and isolates it from the floor system. One of the steel arms is excited by means of a short drive rod actuated by an electrodynamic exciter. Vibration of the steel masses develops dynamic moments at the ends of the specimen producing vibratory bending in the plane of the assembly.

The mechanical vibration of the second steel arm is detected by a velocity-sensitive pickup, *V*, which generates an electric signal that is amplified and fed back to the driving coil of the exciter. Thus, the exciter is automatically tuned to resonance with the natural frequency of vibration of the assembly. Coarse amplitude control is obtained by adjusting the gain of the power amplifier. However, all electronic circuits of this nature are inherently unstable and change their gain with variations in temperature, line voltage, etc. A special control system for fine adjustment in holding a constant amplitude has been devised and will be described in the next section.

In Fig. 5 is shown a block diagram indicating the principal electrical components and wiring circuit for the system. The velocity pickup consists of a permanent magnet and small moving coil which generates a voltage proportional to the velocity of the moving arm. Thus the vibration of the arm is transferred into an alternating current which is magnified by the voltage amplifier and power amplifier and then fed to the exciter. The exciter unit as indicated at the right in Fig. 5 (or in Fig. 7(*a*)) converts the electrical impulses into alternating forces and is similar to a large electrodynamic radio loudspeaker. It contains a d-c coil for producing a magnetic field, and a moving coil into which is fed the amplified alternating signal from the velocity pickup.[3] By means of a drive rod, the exciting forces developed are transmitted to the assembly of Fig. 4. After experimenting with several different designs and materials, it was found that rods made from small metal wires buckled under the compressive load or ruptured in fatigue; larger metal rods inadvertently failed because of misalignment or due to kinking while adjusting the U-frame assembly on its spring suspension. However, a rod of ½-in. methyl-methacrylate plastic turned to 0.3-in. in diameter in the central portion gave satisfactory results.

The actual force imparted to the vertical arm by the exciter is negligibly small compared with the inertia forces resulting from vibration of the arms. For all practical purposes, the stresses in the specimen may be thought of as being developed solely by the vibration of the moving arms. An alternating axial load is also imposed on the specimen by

[3] Devices of these types are commercially available from several sources. The particular units employed consisted of an M-B Velocity Pickup, and M-B Vibration Exciter of 25-lb force capacity with the associated amplifier and power supply as manufactured by the M-B Manufacturing Co., New Haven, Conn. The voltage amplifier employed was a Hewlett-Packard Type 450A Voltage Amplifier, set for 20-d.b. gain. Similar shaker equipment and power supply systems are also manufactured by Calidyne Co., Winchester, Mass., and by Westinghouse Electric Corp., East Pittsburgh, Pa.

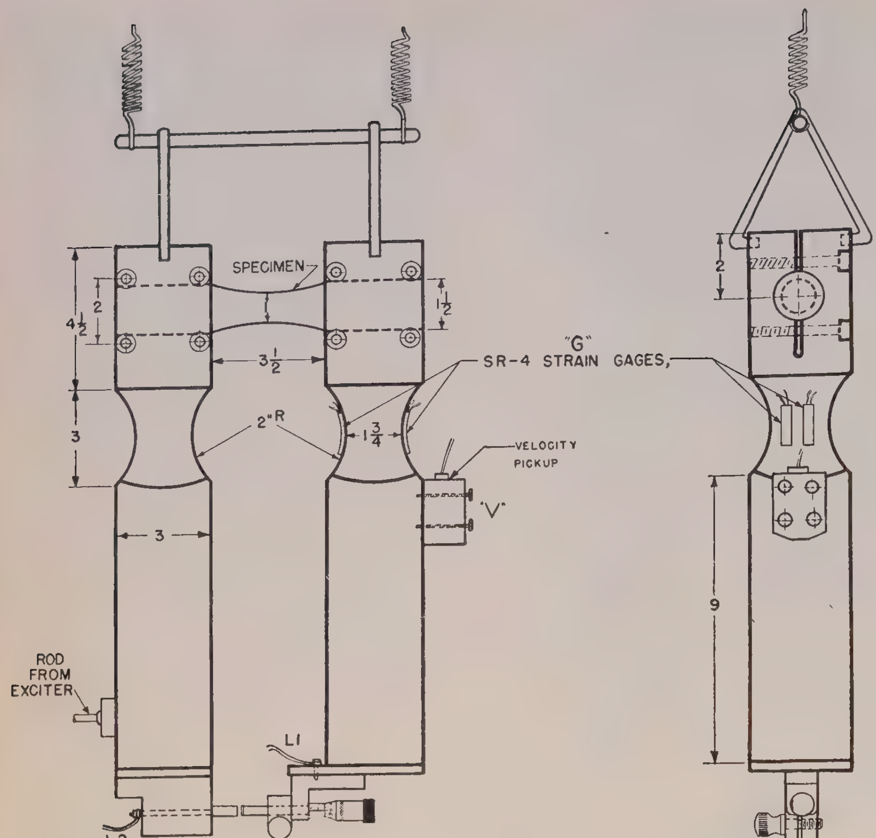

Fig. 4.—Assembly of Principal Mechanical Components of the Machine.

the lateral acceleration of the arms; however, the axial stresses are small (roughly 4 per cent) compared with the magnitude of the predominant flexural stresses, but their presence should be recognized, as will be mentioned in a later section on calibration of the machine.

The oscilloscope and audio-frequency oscillator indicated in Fig. 5 are used to measure the frequency of the vibration. This is readily accomplished by comparing the sinusoidal signal from the velocity pickup (on the vertical axis of the oscilloscope) against a known signal (on the horizontal axis) from the audio-frequency oscillator. A stable circular or diagonal straight-line pattern is obtained when the two frequencies are the same. The calibrated dial on the audio-oscillator then indicates the correct frequency of stressing directly in cycles per second.[4]

A time meter (clock) reading directly in minutes was used to measure elapsed time of a test. The number of cycles of operation to cause failure are compute by direct multiplication of the time increment and frequency. Repeated checking during a number of tests indicated that the natural frequency of vibration did not change by a measurabl amount for any of the specimens teste until a visible crack penetrated th specimen. As the crack progressed the natural frequency of the assembly decreased appreciably, but once formed the cracks propagated rapidly.

In order to shut off the equipmen when the specimen failed, the instru ments were all plugged into one multi socket strip and the 110-v a-c suppl was controlled by the relay syste shown in Fig. 6. In the early develop ment work, lengths of enameled coppe wire (a few thousandths of an inch i diameter) were cemented to top an bottom surfaces of the test specime with Duco cement, and these wer hooked in series with the sensitive rela and 45-v battery shown in the uppe right-hand corner of Fig. 6. Whe utilizing this "control wire," the termi nals H and K were shorted. By closin the "on" switch and *momentarily* de pressing the starting switch, a hold-i coil energized and "latched-in" the 110 v circuit. Any breakage in the contr wire circuit (caused by cracking of th specimen) de-energized the sensitive re lay causing contact at C, which ene gized the throw-out coil shutting off th instruments. However, when alum num specimens were tested, the strain were so large that copper wires ceme ted to the specimens would crack a shut off the equipment before the spec men failed.

A later mechanism incorporated the machine used the same circuit e cept that the leads to the "control wir were shorted, and the leads K and were brought out to the "amplitud drop control mechanism" shown in Fi 7. This small mechanism (placed the exciter near the drive rod) consist of a piece of piano wire on which w slipped a small brass weight free to sli up and down the wire. The sma weight was raised to the top of the wi and the length of wire adjusted to give natural frequency slightly higher th the resonant frequency of the tuni fork assembly. When set in a vertic position with the exciter driving t machine, the weight would then vibra at the top end of the wire through small amplitude but would not dr down. Any drop in amplitude or fr quency of the exciter caused the sm weight to slide down the wire (becau of its decrease in vibration) and to sh across the two contacts H and K indicated in Fig. 7(b). Shorting th leads energized the throw-out coil

[4] Since audio-frequency oscillators are often in error, it has been found desirable to calibrate the instrument over the appropriate portion of the scale just prior to use. Sufficient accuracy can be easily obtained by checking the oscillator against the 60-cps line frequency by matching with Lissajou figures on the scope (10). For example, for a 1-in. diameter aluminum specimen vibrating at about 43 cps, the instrument was calibrated at 40 and 45 cps which represent multiples of $\frac{2}{3}$ and $\frac{3}{4}$ of the 60-cycle line frequency, and give readily recognizable Lissajou figures on the oscilloscope.

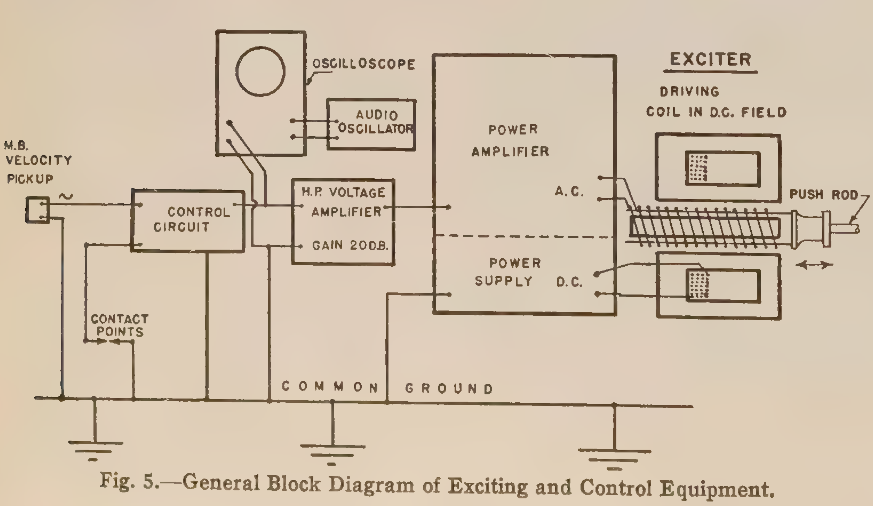

Fig. 5.—General Block Diagram of Exciting and Control Equipment.

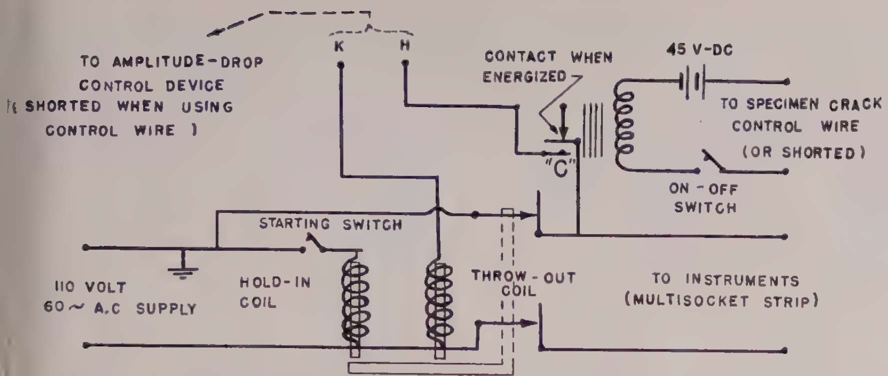

Fig. 6.—Relay Circuits for Shutting Off Equipment When Specimen Cracks.

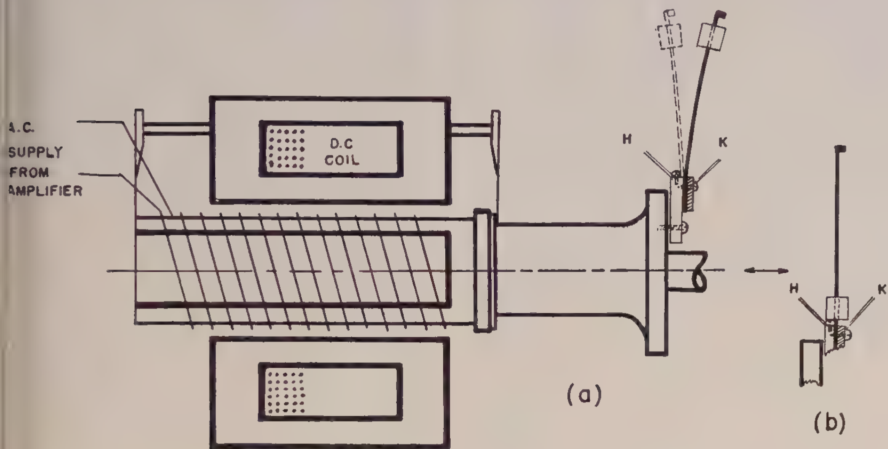

Fig. 7.—Amplitude-Drop Control Mechanism.

(*a*) Cantilever beam vibrating near resonance with the exciter leads *H-K* open. (*b*) Leads *H-K* shorted as the slider weight falls due to amplitude drop.

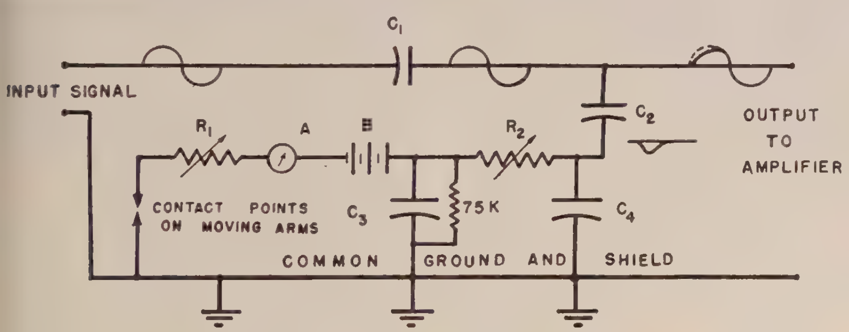

Fig. 8.—Amplitude Control Circuit.

C_3, C_4—0.03 μf
C_1—0.10 μf
C_2—0.06 μf
A—microammeter

B—45-v battery
R_1—1.0 megohm
R_2—0.1 megohm

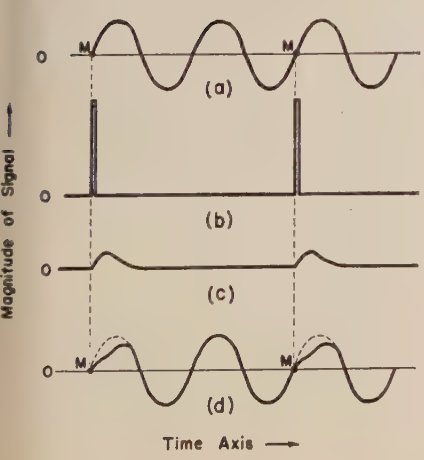

Fig. 9.—Operation of Control Circuit.

(*a*) Sinusoidal signal from velocity pickup. (*b*) Momentary potential developed by contact of micrometer points at *M*. (*c*) Pulse shaped by control circuit when micrometer points make contact at *M*. (*d*) Net signal which is amplified to drive the exciter.

Fig. 6 and shut off all instruments. The on-off switch in Fig. 6 was used in the "on" position when starting and adjusting the machine, and then thrown to the "off" position for "automatic" shutoff after stable operation had been established. This device was very effective in stopping the machine when the crack had developed to a depth of approximately one-third the diameter of the specimen. In case of other difficulties (such as a decrease in line voltage, excessive drop in gain of the amplifier, breakage of drive rod, or difficulty with wiring or connections) a small decrease in amplitude of the exciter was sufficient to actuate the cutoff.

Amplitude Control Systems

As mentioned in the introduction, the chief disadvantage of operating at or near resonance lies in the difficulty of controlling the amplitude within narrow limits. The heart of this mechanism is therefore the control circuit which corrects for any variations in gain of the amplifier system or any changes in hysteresis losses in the specimen during the test. The simple electrical circuit shown in Fig. 8, developed specifically for this purpose, is inserted in the general system as indicated by the block labeled "control circuit" in Fig. 5. This circuit is actuated by means of a micrometer screw and contact point on the arms of the U-frame (see Figs. 3 and 4) which can be pre-set to give the desired amplitude of vibration. Whenever this amplitude of motion is reached, the contact made by the micrometer screw develops a small pulse from the battery *B* through resistor R_1 to ground (Fig. 8). The microammeter *A* (having a range of 0 to 50 microamps) is used to check the zero setting of the micrometer screw and to indicate the average control signal while in operation. The small momentary pulse is "smoothed out" and "shaped" by charging condensers C_3 and C_4 while simultaneously discharging through the 75K resistor. The control signal which is transmitted through C_2 thus consists of a small shaped pulse (as indicated in Fig. 9(*c*)) which is spread out in time duration over approximately $\frac{1}{2}$ cycle of the vibration. This pulse is subtracted from the exciting signal generated by the velocity pickup on the moving arm. The resulting net output is somewhat as shown in Fig. 9(*d*); hence, every time the points make contact, the amplitude of the exciting force is decreased during the next half cycle of operation. By varying the resistors R_1 and R_2, the amplitude and time duration of the control pulse can be adjusted for different amplitudes of vibration of the test specimen or for different frequencies of vibration (when changing from aluminum to steel, etc.). The condenser C_1 is used mainly to isolate the velocity pickup from the control circuit.

The control circuit can be adjusted during operation so that the micrometer screw makes contact let us say every second or every third cycle of vibration.

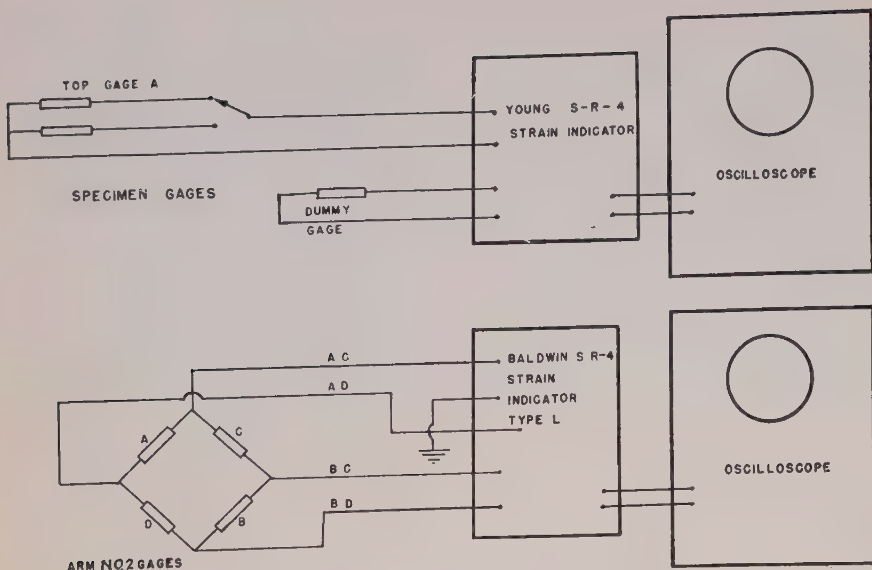

Fig. 10.—Diagrammatic Sketch of Strain Measuring Equipment.

Thus, if operating at 44 cps, a very small correction to the amplitude may be obtained 22 times per sec. Since the exciting forces are small, these control signals develop forces that are practically negligible; no variation in amplitude or strain in the specimen can be detected while in operation. Furthermore, the current carried by the contact points is only a few microamperes in a noninductive circuit, and hence no difficulties have been encountered with pitting or oxidizing of the contact points. The points have given no trouble for hundreds of millions of cycles of operation.

If the line voltage or gain of the amplifier decrease during operation, the points will contact less frequently (say perhaps every third or fourth cycle) to maintain the same amplitude of vibration. Conversely, if the gain increases and the exciter tends to overdrive the specimen, the points will contact more frequently to maintain the stable amplitude. The hunting is negligibly small and imperceptible in the large mechanical arms of the U-frame; the points are hovering just on the verge of contact in every cycle. The control system has been found to operate in a stable and satisfactory manner for long periods of continuous operation without difficulty.

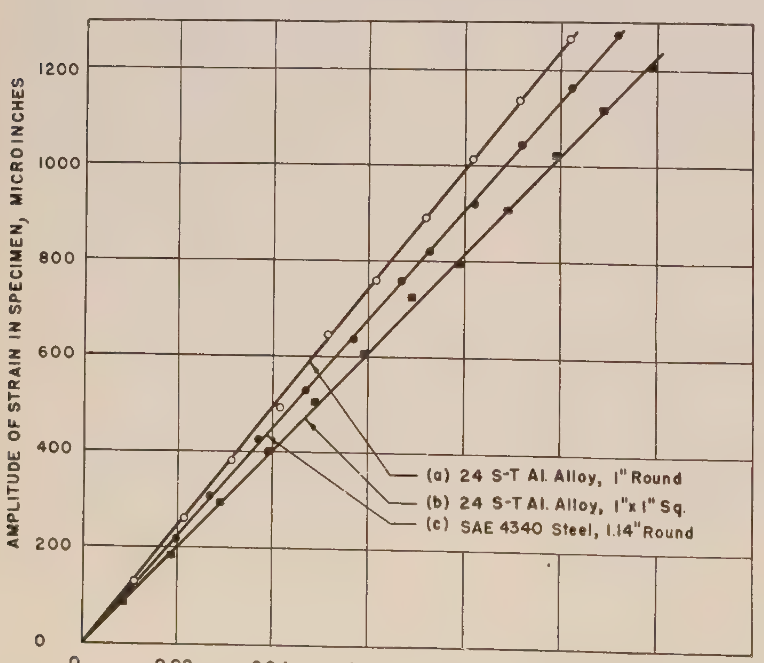

Fig. 11.—Calibration Data for Several Types of Specimen, Based on Amplitude of the Vibration.

Calibration of Machine

In order to express the bending moment in the test specimen in terms of quantities observed during the test, a theoretical study was made by use of dimensional analysis in conjunction with the ordinary assumptions of elasticity and theories of simple harmonic vibrations. The results were checked against measurements with SR-4 strain gages placed on a series of specimens, the readings being taken while in operation under various amplitudes of motion. A diagrammatic sketch of the strain-measuring equipment is shown in Fig. 10. By cementing type AD-1 gages to top and bottom of the specimen, these could be individually selected and read with a Young strain indicator using an oscilloscope to indicate unbalance of the a-c bridge circuit, utilizing methods previously described by H. J. Grover (6) and W. J. Worley (7).

Four SR-4 strain gages were also permanently cemented on the reduced section of one of the inertia arms in the loading frame as indicated at G in Fig. 4. These gages comprised the four arms of a Wheatstone bridge wired for dynamic strain measurement as indicated in Fig. 10. The signal from these gages was directly proportional to the bending moment transmitted by the arm to the test specimen and was utilized as a further check on the magnitude of stress developed in the specimen with a given amplitude (obtained by pre-setting the micrometer screw). With four active gages, the small strains in the arm were multiplied by a factor of 4, giving increments on the indicator that were more comparable with the strains in the test specimen.

A number of calibrations were made of the assembly with the micrometer screw pre-set to a given increment of motion of the arm; readings were observed for strains in top and bottom of specimen, and for the bridge circuit of the loading arm. A sample of individual readings of this nature is shown in Figs. 11 and 12 for the amplitude of strain in the bottom fiber of the test specimen.[5] By careful measurement it was found that the strain in the bottom of the specimen was approximately 4 per cent greater than the strain in the top of the specimen (in each case the extreme fiber was subjected to a completely reversed cycle of stress). A check of the experimentally observed specimen strains *versus* micrometer gap or of specimen strains *versus* readings of the loading arm agreed closely with theoretically computed values.

Since SR-4 strain gages rupture rather quickly when subjected to high cycl

[5] Values shown are the "single-wave amplitude," or half of the "peak to peak" strain.

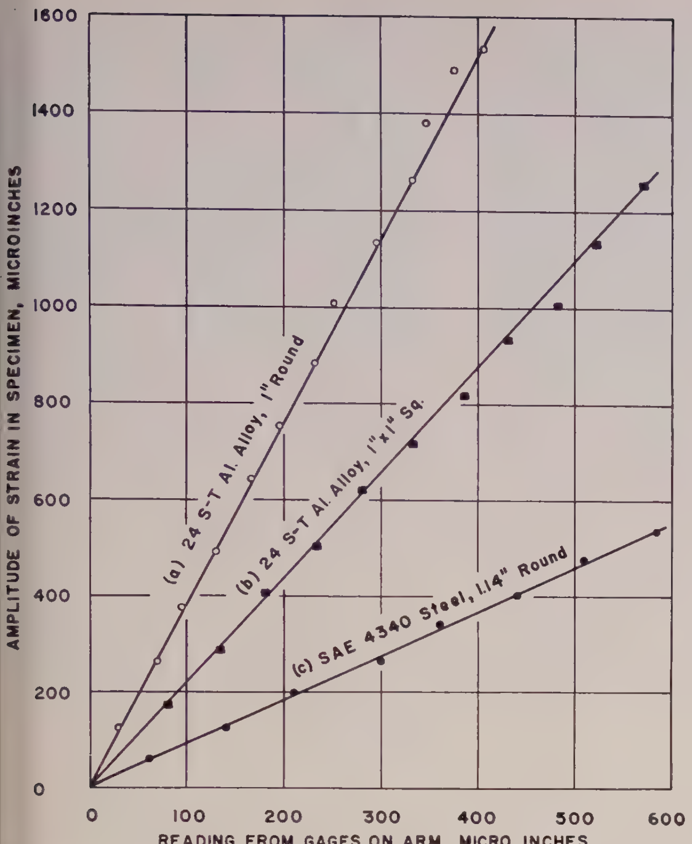

Fig. 12.—Calibration Data for Several Types of Specimen, Based on Strains in the Inertia Arm.

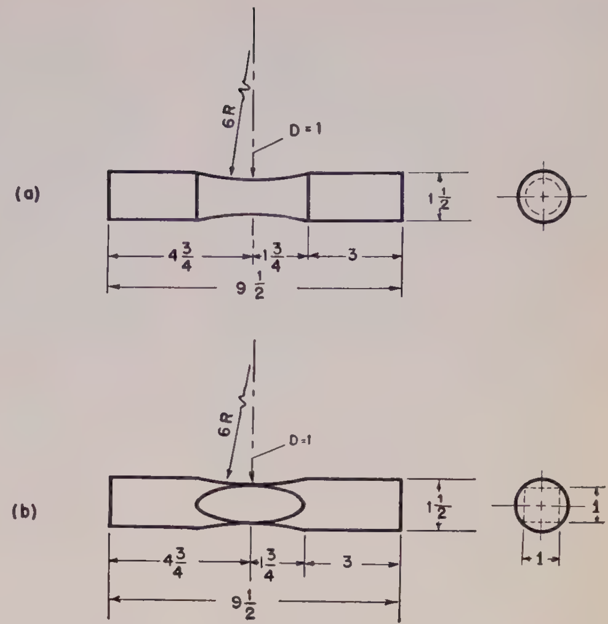

Fig. 13.—Typical Test Specimens.

(*a*) Round, 1 in. diameter. (*b*) Square, 1 by 1 in. (all dimensions are in inches)

strains, the calibrations were conducted with gradually increasing increments of stress until the gages on the specimen ruptured. It was then assumed that for an elastic assembly the calibration curves could be extrapolated to higher values of strain without appreciable error. It seemed logical to assume that there must exist a definite linear relationship between the range of load on the specimen and the amplitude of strain in the loading arm at a point near the specimen. These relationships were established by means of calibrations at low loads (up to those at which the wire strain gages on the specimen ruptured) for at least four or five specimens of each type.

In setting up the machine for a given test, the micrometer screw was checked for zero reading by turning it to the closed position as sensed by a sudden indication on the microammeter in Fig. 8, then opened and locked in a pre-set condition to the desired gap for the particular stress desired, as calculated from the calibration curve. The machine was then started,[6] achieving stable amplitude in less than a minute, and readings of the four gages on the arm were observed periodically throughout the duration of the test. The final calculation of stresses in the specimen were those computed from the observed readings in the loading arm which in practically all cases agreed very closely with the stresses computed from the micrometer gap setting.

Preliminary Test Data

The performance of the machine was studied in its early stages by tests of round specimens of SAE 4340 steel 1 in. or $1\frac{1}{8}$ in. in diameter, at stresses as high as 125,000 psi. A later series of experiments now under way involves an extensive study of round and square specimens of 24S-T4 aluminum alloy of the types shown in Fig. 13, and of square specimens with rounded corners. A program has been outlined to study the influence of shape of cross-section on fatigue strength, somewhat along the lines of previous investigations (**8**, **9**), but utilizing a minimum dimension of 1 in. in the test section rather than the more commonly employed small specimens of about 0.3 in. diameter.

The *S-N* curves shown in Fig. 14 illustrate data obtained thus far for round and square specimens cut from $1\frac{3}{4}$-in. diameter rolled bars. The ordinates in this figure represent the ampli-

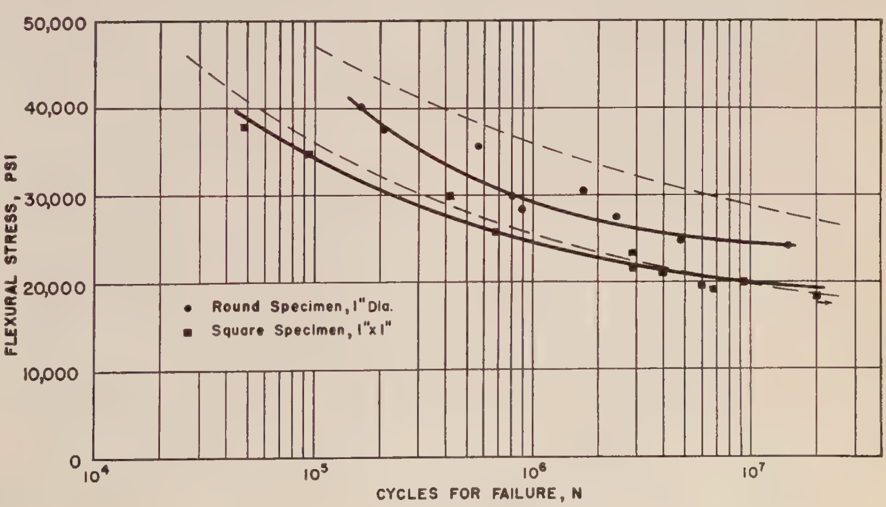

Fig. 14.—*S-N* Curves for 24S-T4 Aluminum Alloy Specimens.

[6] To start the vibration it is only necessary to turn the power amplifier up to a high "gain"; as the amplitude builds up, the gain is manually reduced to a setting that is just sufficient to maintain frequent contacting of the micrometer control points.

tude of alternating stress in the *bottom* of the test specimen at the minimum section. However, due to inherent variations in the material itself, it has been observed that several of the round specimens failed from the top, though the stresses in this location were approximately 4 per cent smaller than those on the bottom fiber of the beam. It will be observed that the fatigue strength at 10,000,000 cycles for the square specimens was approximately 16 per cent smaller than that for the round specimens; this is consistent with the results of previous investigations (**8, 9**). In the above tests it was assumed that failure of the specimen had occurred when a crack had progressed approximately one-third of the depth of the specimen and the shut-off mechanism had been actuated. However, close observation of a number of specimens indicated that there was only a small difference between the number of cycles based on (*a*) formation of first visible crack, and (*b*) the total number required to produce a crack about three-fourths of the depth of the specimen; the difference was negligible when plotted on the usual *S-N* curve.

For comparison with the results in Fig. 14 there are shown two dashed lines representing the approximate boundaries of the scatter band obtained by Templin and co-workers (**11**) from tests of a large number of rotating-beam specimens of 24S-T4 cut from rolled and extruded sections. It will be observed that the points for the 1-in. diameter round specimens fell well within this nominal scatter band. However, this is probably a "chance" effect because of the differences in size and test conditions involved. For example, it has been demonstrated (**12**) that rotating-beam specimens exhibit *lower* fatigue strengths than those tested in reversed bending in one plane. On the other hand, small diameter specimens exhibit *higher* endurance limits than those of large diameter. It seems probable that as a net result of these two conflicting tendencies the 1-in. specimens tested in plane bending thus exhibited about the same fatigue behavior as specimens of 0.3 in. diameter tested in rotating-beam machines.

As operated in these tests (with inertia arms weighing about 35 lb apiece), the natural frequency of the assembly was about 36 cps for round aluminum alloy specimens and about 44 cps for square specimens. By changing to alloy-steel specimens having a diameter of 1.14 in., the natural frequency was 71 cps; that is, the resonant frequency of the assembly is determined primarily by the stiffness of the specimen. Hence, the frequency of stressing can also be altered appreciably by changing the length and diameter of the test piece.

No difficulty with maintenance of the equipment has been encountered during operation over approximately a 1-yr period outside of changing the 45-v batteries about every four months, and occasionally cleaning dust or dirt from the silver contact points in the control circuit. No repairs have been found necessary except for replacement of the "drive rod" in the earlier stages before the methyl-methacrylate rod was adopted.

Adaptability of the System

The general circuits and method of excitation and control employed in this machine can be readily converted to use in cases where an axial or a torsional loading is required. Specimens having a wide variety of shapes and lengths can be tested with the present design (or can be accommodated by making new inertia arms for attachment to the specimen).

The equipment as arranged seems to offer advantages in the study of changes in other phenomena during the progress of a fatigue test, such as: (*a*) changes in stiffness of the specimen may be appraised by observation of any changes in resonant frequency of the assembly, (*b*) the relative dissipation of energy at any instant throughout the duration of a test can be observed by means of a wattmeter in the exciter circuit, (*c*) any changes in temperature of the specimen due to hysteresis can be measured without difficulty, and the temperatures of operation are not influenced by transfer of heat from bearings (as is quite noticeable in the case of most rotating-beam machines).

It is of interest to note that the machine operates as a "constant-deflection type" because of close control of the amplitude of vibration. However, the loads transmitted to the specimen are directly proportional to the amplitude multiplied by the square of the frequency of vibration. Experimentally it has been found that the frequency of vibration does not change perceptibly until a visible crack is developed in the specimen. Thus, the assembly also operates as a "constant force amplitude" machine until a sizable crack is formed.

The exciting forces need only be large enough to supply the energy dissipated in hysteresis and air damping and the mechanical losses in the supports and clamping of the specimen. Hence, the same type of system could be employed in testing extremely large members by changing the size of the masses attached to the test piece. The quietness of operation, absence of wear on mechanical parts, and freedom from transmission of vibrations to the building are all desirable features inherent in the design of the apparatus.

Acknowledgment:

The development of the equipment described in this paper was undertaken as a portion of the work of the Department of Theoretical and Applied Mechanics and of the Engineering Experiment Station of the University of Illinois. The fatigue studies reported are being sponsored by the Office of Naval Research as a part of Project NR-031-005. Grateful acknowledgment is made of the assistance rendered by M. Young, Student Assistant, in the design and construction of the control circuit, and to P. Mathur, Research Assistant, who had aided materially in conducting the tests, analyzing test data, and in making theoretical analyses of the vibrational characteristics of the assembly.

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DISCUSSION

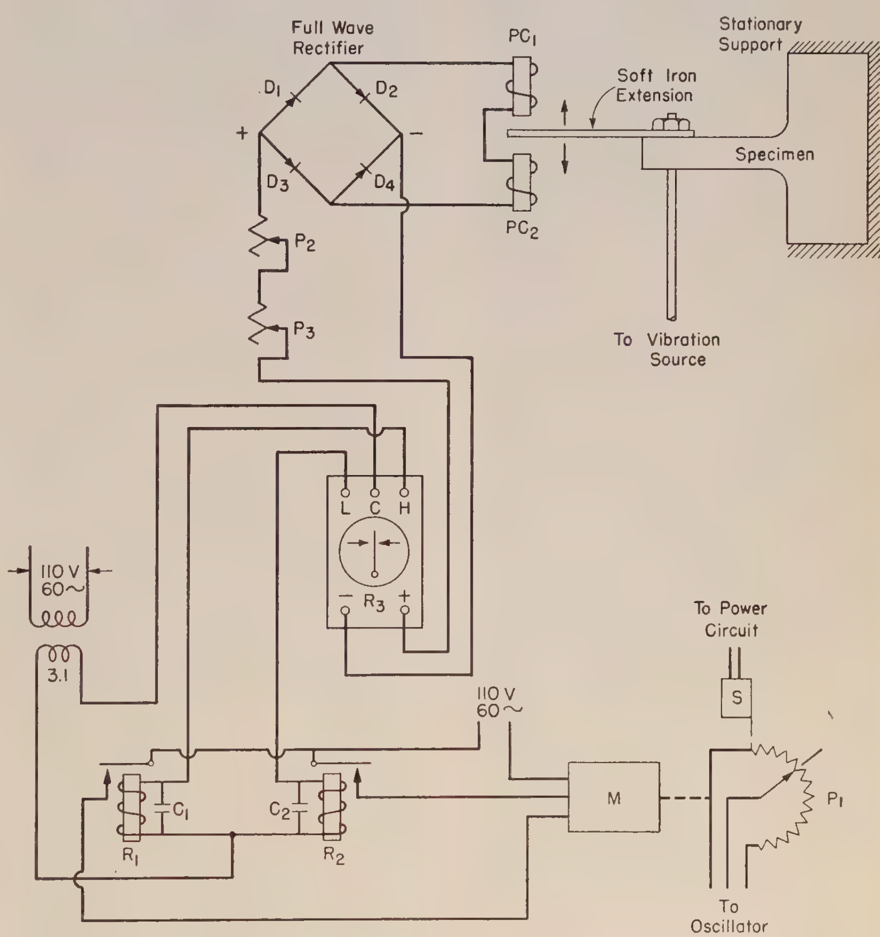
M. R. Gross[1] (*by letter*).—I wish to point out a system which has been in use for several years at the Naval Engineering Experiment Station for controlling the amplitude of vibration fatigue equipment. The system is shown in Fig. 15. Briefly it consists of generating an a-c emf by placing pick-up coils with permanent-magnet cores near a portion of the vibrating system. The emf is rectified and fed into a current relay. Depending upon the current, this relay remains neutral or in a high or low position. The high or low positions operate relays which control the direction of a motor. This motor rotates the oscillator-gain potentiometer to increase or decrease the power to the vibration source as the case may be. A switch is placed at one end of the potentiometer in order to secure the equipment should the power requirements become excessive.

In actual operation, the amplitude required to produce the desired stress is applied by manual tuning and gain adjustments of the oscillator. The pick-up coils and potentiometers P_2 and P_3 are then adjusted so as to place the contactor of the current relay in the neutral position. The gain of the control device is placed on the low side and is then cut into the oscillator. The control system then takes over the job of maintaining the amplitude constant.

It is agreed that a system such as ours is insensitive to instantaneous changes in amplitude. However, its sensitivity and cost are such as to make it suitable for many applications. A case in point is the results obtained on testing many specimens of the type shown in Fig. 15. The resonant frequency for this setup was approximately 185 cps. We have found that a 2 cps decrease in frequency caused by a temperature rise or incipient failure is sufficient to cause a shutdown of the equipment.

T. J. Dolan (*author's closure*).—I wish to thank Mr. Gross for contributing the description of the ingenious control system utilized for vibration studies at the Naval Experiment Station. Basically, the method of operation in his system requires "hunting" of the amplitude around a desired value; in this respect it operates somewhat similarly to entirely different equipment described by Gadd and Ochiltree (4). The characteristics of the sensitive relay included in Mr. Gross's circuit are such that a change in current from 0.490 to 0.510 ma is required to reverse the motor driving the gain control. Since the current developed in the relay is proportional to the amplitude of vibration of the specimen, this requires approximately 4 per cent change in the vibration amplitude to reverse the relay. Of course there are many systems in which this degree of hunting may not be objectionable, but in fatigue testing the effects of this fluctuation in amplitude are somewhat vague; hence an attempt was made in the system described by the author to limit hunting to a negligible amount. The system described by Mr. Gross has certain desirable features in that it is not influenced by changes in the line voltage. However, minor difficulties could arise from changes in temperature and humidity (affecting the rectifier or resistors) from changes in contact resistance P_2, P_3 or from irregular sticking of the points in relay R_3. These difficulties, however, have probably been overcome by careful design and periodic checking of the operation of the circuits.

It might be of interest to point out that other control systems were investigated for the machine described in the paper. For example, our first attempt was to utilize the four wire strain gages on the arm of the U-frame as a Wheatstone bridge, and to compare the output signal from this bridge with a standard "pre-set" signal. The difference was



Components:
R_1 and R_2—Sensitive Relay—Coil 75 ma 60—Contact 115 v, 2a; Struthers-Dunn—112 XAX
R_3—d-c current Relay—Range Low 0.490 ma, High 0.510 ma; Weston Model No. 534
PC_1 and PC_2—Pick-Up Coil—Core 3/8 in. ϕ ALNICO—No. 40 Wire 1000 ~
D_1, D_2, D_3 and D_4—Germanium Diodes—1N34
P_1—Potentiometer—Equal to that of Oscillator Gain Control
P_2—Potentiometer—2000 ~
P_3—Potentiometer—200 ~
C_1 and C_2—Paper Capacitor—0.01 MFD.
S—Microswitch Cut-Off
M—Reversible Motor

Fig. 15.—Amplitude Control System.

[1] U. S. Naval Engineering Experiment Station, Annapolis, Md.

then amplified and used to operate a control tube to increase or decrease the output of the amplifiers. Difficulty was encountered because of the necessity of employing high gain amplifiers to bring the level of the signal from the wire gages up to a usable value. Furthermore, a control system which utilizes the *difference* between two signals requires not only extremely precise control of the standard signal, but also great amplification of the difference to operate any control mechanism. The inherent instability of amplifiers and difficulties from stray "pickup" make such a control system unreliable.

A second attempt utilized a circuit somewhat similar to that described in the paper but operated by a bias of the amplifier for a time duration of 0.1 to 0.2 sec whenever the micrometer points made contact. This resulted in a measurable hunting of the system; it also proved undesirable because of the sudden surge developed by the amplifier when the bias was applied or removed.

The final control circuit as described in the paper seemed to offer considerable advantage in that no detectable hunting is observed and the electrical components of the control system consist merely of a few resistors and capacitors that have given no trouble in operation. The system is, however, limited to an application involving an exciting force which is transmitted to the specimen by a power amplifier system driving an electrodynamic or electromagnetic exciter. The circuit is not adaptable to operation of machines excited by mechanical oscillators such as that employed by Gadd and Ochiltree.

A Suggested Method of Test for Hiding Power of Paints

By M. H. Switzer[1]

On May 16, 1946, a group composed of Messrs. F. C. Schmutz, R. H. Sawyer, and A. E. Jacobsen met under the chairmanship of Mr. A. E. Jacobsen for preliminary study of the subject of Project 10, "Method of Test for Absolute Hiding Power," of Subcommittee X, on Optical Properties of ASTM Committee D-1, on Paint, Varnish, Lacquer and Related Products. The preliminary study was to include a review of what had been done up to that time with regard to "absolute" hiding power determinations, the evaluation of the need for a test method for such determinations and the outlining of some of the steps to be taken in a progressive study that would result in the development of an acceptable method. The results of this preliminary study were reported to Subcommittee X at the ASTM meeting in Buffalo, N. Y., on June 25, 1946.

From the work reported in the literature, it was considered that "absolute" could connote a method which would evaluate a paint in fixed terms of spreading rate and contrast ratio rather than in relation to a material reference standard (as in the present ASTM Method D 344[2]) or it could connote a method by which hiding power would be determined as a function of the film thickness, such as spreading rate, associated with complete obliteration of some specified background. The former of the two connotations was recommended along with the use of photometric methods for making the necessary determinations.

The preliminary study indicated that a need existed for revision of the present standard method, D 344. Some of the problems which appeared to require consideration included:

1. The determination of the allowable tolerance limits of the reflectances of the contrast background.

2. Assuming the background substrate to be paper and that film thickness measurements would be made by a weight method, determination of the extent to which temperature and humidity must be controlled during the application of the drying schedule to the paint coating and during subsequent manipulations of the test charts.

3. The determination of tolerance limits associated with the thickness of test film application and the study of film applicators with regard to their ability to meet these tolerances.

4. The determination of allowable tolerance limits in photometric reflectance measurements.

5. The change in hiding power occurring with change in paint reflectivity as related to the luminances of the paints included in the scope of the method.

6. Study of the status of work by, and the findings of, other groups with regard to standardization of reflectometric methods.

7. Study of methods to be employed for interpreting the collected data and for reporting the test results.

A task group, under the continued chairmanship of Mr. A. E. Jacobsen, was formed, composed of Messrs. R. H. Sawyer, F. C. Schmutz, G. G. Sward, M. Van Loo, H. F. Saunders, L. A. Melsheimer, E. J. Dunn, Jr., E. W. McMullen, and M. H. Switzer. This task group has held numerous meetings and has performed a considerable amount of cooperative work toward the development of a method of test which would be an acceptable compromise of the many divergent opinions which have been found to exist regarding the means of obtaining and expressing a measure of hiding power.

The results of these deliberations were presented at an open meeting during the 1950 spring meeting of ASTM at Pittsburgh as a "Proposed Method of Test for Contrast Hiding Index of Paints." Several constructive criticisms of this suggested method were presented at that time, notable among them being those of Messrs. H. K. Hammond and B. A. Silard referring to the photometric specifications. A revision of the suggested method, based on these criticisms, was presented at a second open meeting held in Atlantic City, N. J., in June, 1950; again, there were several pertinent suggestions and constructive criticisms made.

The members of the task group, who are familiar with the problems involved in setting up this method, now generally concede that any method which is proposed wherein photometric measurements and functions thereof are the end products (rather than visual comparisons and judgments) must necessarily be more rigidly defined than is the now standard method (D 344); they have, further, become accustomed by usage to the more specific type of terminology required. However, it has become apparent from the tenor of the recent open meetings that the extent to which it has been considered necessary to proceed to attain adequate definition of the test method comes as something of a shock to many people who have not worked through the details of the organization of the method. A further revision of the suggested method, based upon the results of the meeting of June, 1950, has now been drafted and is appended to this paper. This latest revision is presented in order to acquaint a larger group with the character of the suggested method as it is now conceived. Comments and criticisms are solicited from all who are interested in the subject so that the task group may be reasonably assured that no basic changes in the method are yet required prior to embarking on a cooperative study of its precision.

SUGGESTED METHOD OF TEST FOR HIDING POWER OF NON-CHROMATIC OR NEARLY NON-CHROMATIC PAINTS

This is a suggested method and is published as information only. Comments are solicited and should be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.

Scope:

1. To determine the hiding power of non-chromatic or nearly non-chromatic paints by means of photometric measurements without reference to a material paint standard.

Outline of Method:

2. Data are determined for the construction of a curve on rectangular coordinates expressing the relation of contrast ratio to film thickness. This is accomplished by means of photometric measurements of the contrast ratios obtained by spreading uniform films of the paint on charts, having adjacent black and white areas, at known wet film thicknesses and subsequently drying the films prior to making photometric measurements. The contrast ratio-film thickness curve thus produced is interpreted in terms of a value of Contrast Hiding Index or of Spreading Rate by either of which values one paint may be compared with another paint with regard to ability to hide background contrast.

Definitions:

3. (*a*) *Contrast Ratio, C.*—Ratio of the reflectance (Note) of a dry paint film over a black substrate of 5 per cent or less reflectance, to the reflectance of the same paint, equivalently applied and dried, over a substrate of 80 per cent reflectance, where the spatial and spectral characteristics of the photometry and the thickness characteristics of the paint film are as defined in the body of the method. The quantity C is a practical approximation of $C_{0.80} = R_0/R_{0.80}$.[3]

NOTE.—Unless otherwise modified, the term "reflectance" as used in this method connotes luminous directional reflectance referred to a freshly prepared magnesium oxide surface, as defined in the Tentative Definitions of Terms Relating to Paint, Varnish, Lacquer and Related Products (ASTM Designation: D 16),[4] and in Section 2 of the Standard Method of Test for Spectral Characteristics and Color of Objects and Materials (ASTM Designation: D 307).[5] In Section 4 of Method D 307 the magnesium oxide reference is defined.

(*b*) *Contrast Hiding Index, CHI.*—Contrast ratio produced by a paint applied at some specified wet film thickness. The specified wet film thickness is written as a subscript; that is, $CHI_{x\ (\text{mils})}$.

(*c*) *Spreading Rate, SR.*—Number of square feet over which a gallon of the paint can be uniformly spread to produce some specified contrast ratio, y. The specified contrast ratio is written as a subscript; that is, $SR_{(y)}$.

(*d*) *Non-Chromatic or Nearly Non-Chromatic Paints.*—Paints bought and sold as "white," "gray," or "black" paints. In terms of Munsell notation[6] such paints will have no greater than Chroma 1 at any Hue and Value.

Apparatus:

4. The apparatus shall consist of the following items, or alternates that will have equivalent characteristics or will provide equivalent performance:

(*a*) *Test Charts.*—Smooth surface paper charts of sufficient size to accommodate the film application mechanism (leaving an excess which may be trimmed) and having adjacent black and white areas of sufficient size to permit reflectance determinations. The black and white areas of the chart surface shall be coated with a varnish or lacquer or otherwise rendered impervious to the paints to be tested. Both the black and white areas shall be spectrally neutral; a spectral directional reflectance curve[7] of the black substrate employing a 10-mμ effective wave length slit width shall show no values greater than 5 per cent throughout the interval 400 to 700-mμ wave length; a spectral directional reflectance distribution curve of the white substrate employing a 10-mμ effective wave length slit width shall show no values deviating by more than 5 per cent from the mean spectral directional reflectance throughout the interval 400 to 700-mμ wave length. The luminous directional reflectance of the white substrate shall be within the limits 75 to 85 per cent and shall be uniform throughout the area of the substrate within limits ± 0.5 per cent of the determined mean value for the area.

(*b*) *Paint Spreading Device.*—Any means of applying a paint film the thickness of which does not deviate over the coated area by more than ± 5 per cent of the mean coating thickness.[8]

(*c*) *Glass Plates.*—Thin glass plates of thickness similar to that used for microscope specimen slide glasses and of convenient size (about 6 sq in. in area is suitable).

(*d*) *Reflectometer.*—A reflectometer designed (1) to provide 45 deg irradiation and 0 deg viewing, the reciprocal of this geometry or a geometry the performance of which can be demonstrated to the mutual satisfaction of producer and consumer to be practically equivalent, for the purposes of this method, to the 45 deg to 0 deg system,[9] (2) to allow only diffusely reflected radiant flux to be incident upon the measuring element, and (3) to employ a photometric system, including source, filters, and receptor, which will provide a response closely similar to the luminosity function of the I.C.I. standard observer to standard illuminant C. If the photometric instrument employed provides data in terms of the spectral directional reflectance distribution, the luminous directional reflectance shall be calculated (Note) by use of the response function of the I.C.I. standard observer to the energy distribution of standard illuminant C.

NOTE.—In Section 13 of ASTM Method D 307 the several methods for calculating the luminous directional reflectance from spectral directional reflectance distribution data are either given directly or are referred to.

Procedure:

5. (*a*) Select seven test charts from among the charts received from the supplier in one shipment. Suitably identify six of these charts and weigh each to the nearest milligram. Record these weights under "*I*." (See Data Table on the Work Sheet, Section 7(a).) Identify the seventh chart as the control test chart (Note 1), weigh to the nearest milligram, and record this weight under "*F*."

NOTE 1.—The weight of a chart will vary with humidity. It is, therefore, necessary that an unpainted chart be employed as a control and that any change in the weight of the control be applied proportionately to the painted test charts.

(*b*) Determine the reflectance of the white area of each of the six test charts other than the control and record the value for each chart under "*W*."

(*c*) Apply a sample of the well-mixed paint (thinned as necessary for good flow characteristics using a nonoxidizing and nonreacting type of solvent) by means of the selected application method at different thicknesses, one thickness to each of the six test charts.

NOTE 2.—Experience has indicated that six determinations generally provide accuracy in the estimation of the locus of the contrast ratio-film thickness points which is consistent with the

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

[1] Research Dept., Continental Can Co., Inc., Chicago, Ill.

[2] Standard Method of Test for Relative Dry Hiding Power of Paints (D 334 – 39), 1949 Book of ASTM Standards, Part 4, p. 430.

[3] D. B. Judd, "Optical Specification of Light Scattering Materials," *Journal of Research*, Nat. Bureau Standards, Vol. 19, No. 3, September, 1940, p. 291, Eq 3b, RP 1026.

[4] 1949 Book of ASTM Standards, Part 1, p. 4.

[5] 1949 Book of ASTM Standards, Part 4, p. 3.

[6] "Munsell Book of Color," Standard Edition, Munsell Color Co., Inc., Baltimore, Md. The chips for the colors of Chroma 1 are not given but may be interpolated between the colors for the chips for the non-chromatic value scale and the colors of the chips for Chroma 2.

[7] Description of Terms and Symbols in the Standard Method of Test for Spectral Characteristics and Color of Objects and Materials (ASTM Designation: D 307), 1949 Book of ASTM Standards, Part 4, p. 433.

[8] Tentative Methods for Producing Films of Uniform Thickness of Paint, Varnish, Lacquer and Related Products on Test Panels (ASTM Designation: D 823), 1949 Book of ASTM Standards, Part 4, p. 494; A. E. Jacobsen and H. S. Jensen, "Mechanical Operation of the Bird Film Applicator," ASTM BULLETIN, No. 151, March, 1948, p. 95. Information on the availability of apparatus may be obtained by writing to the American Society for Testing Materials, 1916 Race St., Philadelphia, 3, Pa.

[9] Standard Method of Test for Daylight 45-deg, 0-deg Luminous Directional Reflectance of Paint Finishes (ASTM Designation: D 771), 1949 Book of ASTM Standards, Part 4, p. 446. Note particularly the note given in Section 1, Scope.

over-all accuracy of the method. The range of thicknesses to be employed will depend upon the interpretation to be drawn from the resulting contrast ratio-film thickness curve. Ordinarily, if the interpretation is to be in terms of Spreading Rate, the film thicknesses will be in a high range to obtain contrast ratios close to 1.00, whereas if the interpretation is to be in terms of Contrast Hiding Index, a lower thickness range to encompass a lower value of contrast ratio may be required. If, for some purpose, it is required that both interpretations be obtained from the same contrast ratio-film thickness curve, then the applied paint thicknesses should be spread out into both the low and high ranges; hence, this last is the most generally applicable case.

(*d*) Weigh a pair of the cleaned glass plates to the nearest milligram. Record this weight under "*G*."

(*e*) Sandwich about 2 g of the well-mixed paint, as received, without thinning, between the glass plates, performing this operation quickly to minimize evaporation of the paint solvents. Weigh the plates with the wet paint between them to the nearest milligram. Record this weight under "*H*."

(*f*) Separate the glass plates exposing the painted surfaces. Expose all charts (the six with the applied paint and the unpainted control) and the painted glass plates to drying conditions mutually agreed upon by producer and consumer.

(*g*) Determine the specific gravity of the paint, as received, without thinning, by means of hydrometer or gallon weight cup. (If by means of the latter, division of the gallon weight by the factor 8.33 will convert to specific gravity.) Record the specific gravity under "*S*."

(*h*) After the painted surfaces have dried, outline a portion of the painted area of each of the test charts to include a sufficient area over each of the black and white substrates for obtaining reflectance determinations. Perform this operation on the control test chart also, locating the outlined area in the same relative position as on the painted charts. Make all these areas equal in size. Determine the size of this area in square inches and record under "*A*."

(*i*) Trim all the charts to the outline; discard the trimmings. Weigh the remaining trimmed area of each of the charts to the nearest milligram. Record the weight of the trimmed control test chart under "*B*" and the weights of the trimmed painted charts under "*E*."

(*j*) Weigh the glass plates with the dried paint to the nearest milligram. Record this weight under "*D*."

(*k*) Measure the reflectance of each painted chart over the black substrate. Record these determinations under "R_b."

(*l*) Measure the reflectance of each painted chart over the white substrate. Make these measurements at approximately the same location as was used for determining the reflectance of the white substrate (see step (*b*)). Record these determinations under "R_w."

Calculations:

6. (*a*) *Wet Coating Thickness.*—Substitute the appropriate values for each test chart in the following equation and solve for the thickness of the wet coating, *T*, in mils, by performing the operations indicated under "Calculation of Values of *T*" on the work sheet, Section 7 (*b*).

$$T = \frac{\left(E - \frac{B \times I}{F}\right) \times 1000}{\left(\frac{D - G}{H - G}\right) \times S \times A \times (2.54)^3}$$

(*b*) *Contrast Ratio.*—Calculate the contrast ratio, *C*, for each painted test chart by substituting the appropriate values for each of the test charts in turn into the following correction equation.[3] Carry out these calculations by performing the operations indicated in "Calculation of Values of C" shown in the work sheet, Section 7 (*c*).

$$C = \frac{W \frac{R_b}{R_w} (1 - 0.80R_b)}{W \left(\frac{R_b}{R_w} - 0.80R_b\right) + 0.80 \left(1 - \frac{R_b}{R_w}\right)}$$

(*c*) *Contrast Ratio.*—(Wet Film Thickness Curve).—Plot on rectangular coordinate paper the values of *C* (*y*-axis) *versus* the corresponding values of *T* (*x*-axis). Draw a smooth curve freehand to estimate the true locus of these points.

NOTE.—A refinement in the method for drawing the curve is by use of the values of *C*, R_b, and *T* to estimate the most probable value of the scattering constant, *s*, in accordance with the method described by Judd[3] and subsequently defining the contrast ratio-film thickness curve in terms of plotted points calculated as functions of *s* for as many film thicknesses as are considered advisable for accurate freehand sketching of the curve locus.

(*d*) *Contrast Hiding Index.*—Interpola along the contrast ratio-film thickne curve to find the value of contrast rat *C*, corresponding to the wet film thickne $T = x$, selected by mutual agreement b tween producer and consumer.

(*e*) *Spreading Rate.*—Interpolate alo the contrast ratio-film thickness curve find the value of thickness, *T*, correspon ing to the value of contrast ratio, *C* = selected by mutual agreement betwe producer and consumer. Substitute t value of *T* in the following equation a solve to obtain Spreading Rate (sq ft p gal).

$$SR_{(y)} = \frac{1.604}{T}$$

Work Sheet:

7. The following tabular forms recommended for recording data and c culating values of *T* and *C*; the dash

(*a*) *Data Table:*

Code	*I*	*F*	*W*	*G*	*H*	*S*	*A*	*B*	*E*	*D*	R_b	R_w
(*Con.*)		—		—	—	—	—	—		—		
—	—		—						—		—	—
—	—		—						—		—	—
—	—		—						—		—	—
—	—		—						—		—	—
—	—		—						—		—	—
—	—		—						—		—	—

(*b*) *Calculations of Values of T:*

Code	*a* (*B*/*F*)	*b* (*a* × *I*)	*c* 1000 (*E* − *b*)	*d* (*D* − *G*)	*e* (*H* − *G*)	(*d*/*e*)	*g* (*S* × *A* × 16.387)	*h* (*f* × *g*)	*T* (*c*/*h*)
—	—	—	—	—	—	—	—	—	—
—		—	—						—
—		—	—						—
—		—	—						—
—		—	—						—

(*c*) *Calculations of Values of C:*

Code	*a* (0.80*R*)	*b* (1 − *a*)	*c* (R_b/R_w)	*d* (*W* × *b* × *c*)	*e* (1 − *c*)	*f* (0.80 × *e*)	*g* (*c* − *a*)	*h* (*W* × *g*)	(*f* + *h*)	*C* (*d*/*i*)
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—

indicate the spaces in which data will written:

Report:

8. The report shall include the lowing:

(1) A copy of the work sheet.

(2) A copy of the chart on which original point data of *C versus T* have b plotted and on which the estimate of contrast ratio-film thickness curve been drawn.

(3) The contrast hiding index, *CH* or Spreading Rate, $SR_{(y)}$, or both.

(4) The identification of the coat material by designation, batch numb etc.

(5) A statement of the geometry photometric characteristics of the ref tometer employed.

Bearing Strength of Laminated Plastics

By L. P. Frankel[1] and C. W. Radcliffe[1]

SYNOPSIS

A comparison is made between conventional continuous load tests for the determination of the pin bearing strength of laminated plastic materials and an attempt to design a more rational test using the repeated load-permanent set technique. It is believed that such a test gives (1) a less arbitrary indication of the yield strength of the material in pin bearing, (2) the amount of permanent set or free play to be expected in a pin joint after release from a short-time load, and (3) the stress at which the permanent set wound tend to become excessive. Data are presented on the results of tests with twelve resin-filler combinations by both continuous and repeated load methods.

HIGH-STRENGTH lami-ted plastic materials are finding many plications wherein their high strength-ight ratio and excellent shock ab-ption characteristics are used ad-ntageously. Laminated plastic cos-tic coverings for artificial limbs and ner structural members are examples. these applications limb components often assembled using screws, ets, or bolts as connectors, and many lures are caused by gradual enlarge-nt of the connector holes due to re-ated applications of load. The en-gement of the holes may be attributed the high stresses induced by the con-ctors bearing on the relatively thin lls of the plastic parts.

Heretofore three methods of deter-ning the bearing strength of plastics ve been proposed.[2] These are of two sic types: (1) continuous loading, and repeated loading. The bearing ength determined from the continu-s load tests is defined either as the ess at which the hole is deformed der load by 4 per cent of its original meter, or by an "offset" method. the repeated load tests, the bearing ength is that maximum stress for ich the permanent "set" after un-ding is some fixed percentage of the ginal hole diameter.

Each of these methods of determining bearing strength is subject to certain damental objections. With high-ength laminates, for example, the ess at 4 per cent hole deformation is entially a measure of the elastic dulus of the material, since the load-ormation curve is nearly a straight e up to this point. In the offset method, the bearing strength is the stress at the intersection of the load-deformation curve and a straight line parallel to the initial tangent to the curve originating at a point corresponding to a permanent set of 0.8 per cent of the hole diameter. Thus the offset method determines a bearing strength which is primarily a measure of the nonlinearity of the load-deformation curve. It is apparent, then, that the continuous load methods for determining the bearing strength of plastics yield results whose prime value is the convenience with which they may be determined, but which have no fundamental relation to the behavior of the material under pin-bearing loads.

Aside from this, other considerations minimize the value of continuous load tests. In a large domain of usage of plastics as structural members, the behavior of the joints under *repeated* loading is the factor upon which the design must be based. Thus, either one must establish that the results of continuous load tests are useful for anticipating the behavior of the material under repeated loads, or one must develop a repeated load test capable of yielding rational data with a minimum of effort and cost. While the suggested use of a permanent-set criterion (see above) for the definition of safe bearing loads allows a ready determination of bearing strength, still it is arbitrary. This lack of a rational basis for determining the bearing strength of plastics must be overcome if confidence in the design is to be attained.

The present research was undertaken at the University of California, Berkeley, under the auspices of the Committee on Artificial Limbs of the National Research Council, in an effort to develop a fundamentally sound method of defining the pin bearing strength of laminated plastics for use in artificial limbs.

Materials:

Tests were conducted on two series of low-pressure laminated plastic materials. In the first series specimens were prepared using Selectron 5003 resin as the bonding agent with various types of cloth filler materials. The second series was composed of Fiberglas 182A-14 bi-directional glass cloth laminated with various commercial resins. Selectron 5003 resin and Fiberglas 182A-14 cloth were chosen since they manifested the most consistent results in a previous complete physical properties testing program and are considered excellent materials for use in artificial limbs.

All test specimens for any particular resin-filler combination were cut from a single sheet of laminate 12 in. square and approximately $\frac{1}{8}$ in. thick. Curing procedures followed the manufacturer's recommendation as to pressure, temperature, and time. Alternate layers of cloth were cross laminated at 90 deg for all specimens.

Specimens used in the continuous load tests were similar to the standard test specimens described in Federal Specification L-P-406a-1051, Bearing Strength of Organic Plastics. Specimens were cut 12 by $1\frac{1}{2}$ in., and a $\frac{1}{4}$-in. diam. test hole ($1\frac{1}{2}$ in. from the end) was used, reamed to size.

Specimens used in the repeated load-set tests were prepared as shown in Fig. 1. These specimens were similar to those used in the continuous load tests except that two holes were used, one on each end, and the deformation recorded as the sum of the deformations of the two holes.

Test Methods:

All continuous load tests were conducted as described in Federal Specification L-P-406a-1051 with the exception that the test was started with the specimen preloaded to 25 lb in tension to eliminate slack in the loading jig. The specimens were not conditioned prior to test.

The repeated load-set tests were performed using two three-plate jigs similar to those used in the continuous load tests, one on each end. Two $\frac{1}{4}$-in.

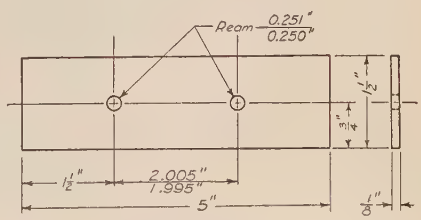


Fig. 1.—Bearing Specimen for Repeated Load - Set Tests.

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[2] J. Bond, "Bearing Strength: Plastics and wood," *Modern Plastics*, Vol. 19, July, 1942, 0. See also: J. W. Fogwell, "Bearing Strength ts On Thermoplastics," Modern Plastics, Vol. May 1948, p. 98.

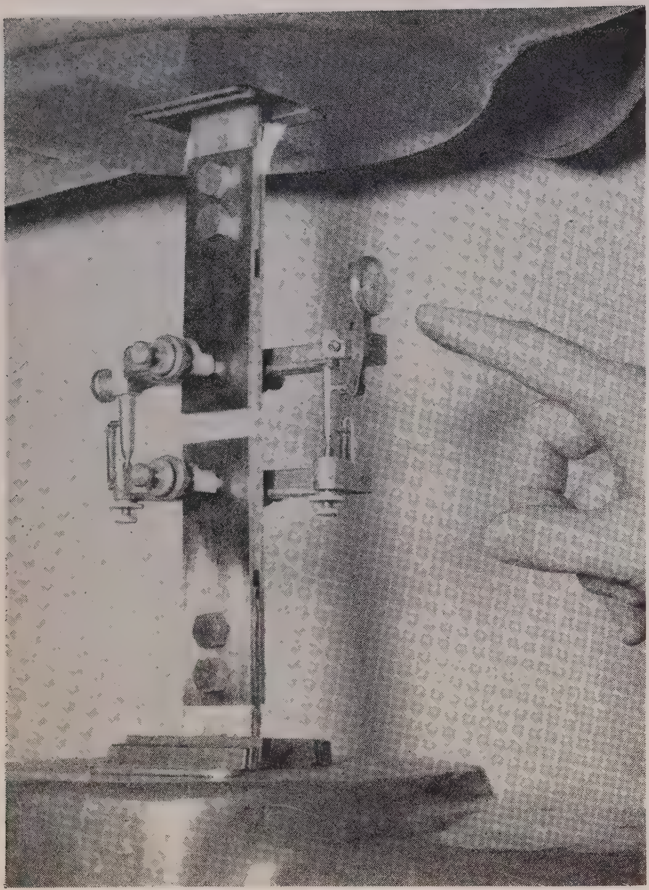


Fig. 2.—Apparatus for Repeated Load-Set Bearing Tests.

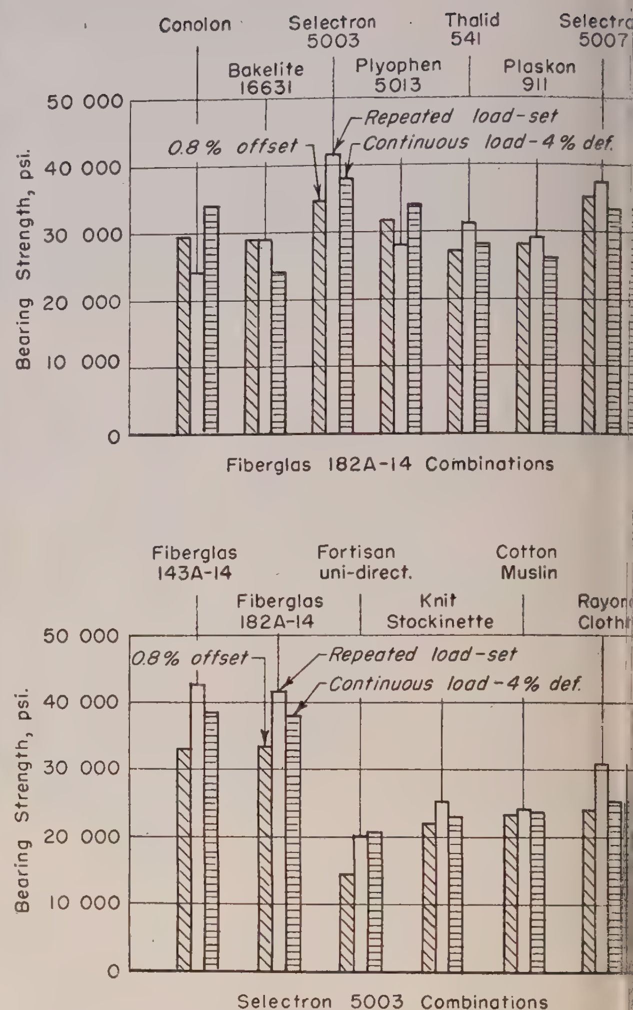


Fig. 3.—Comparative Bearing Strengths of Laminated Plas
Materials by Three Methods.

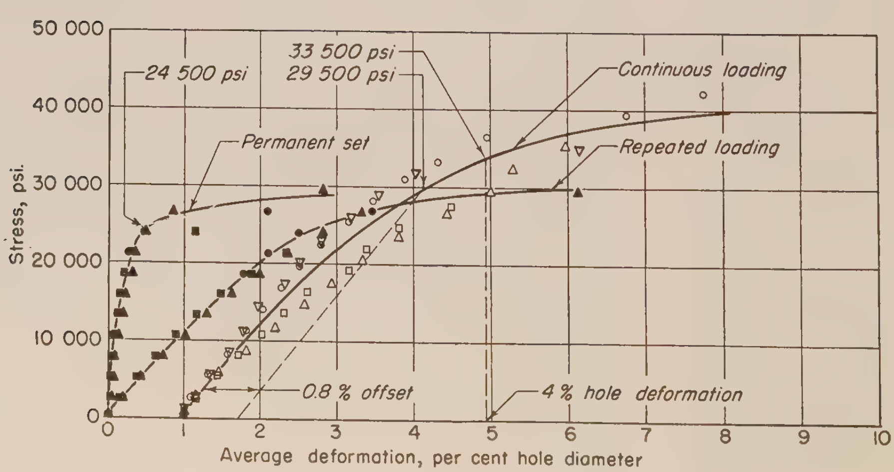


Fig. 4.—Bearing Test Data: Conlon, Fiberglas 182A-14

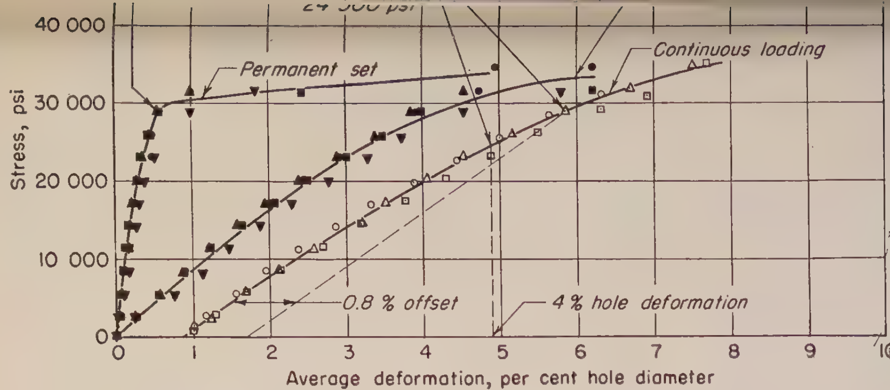


Fig. 5.—Bearing Test Data: Bakelite 16631, Fiberglas 182A-14

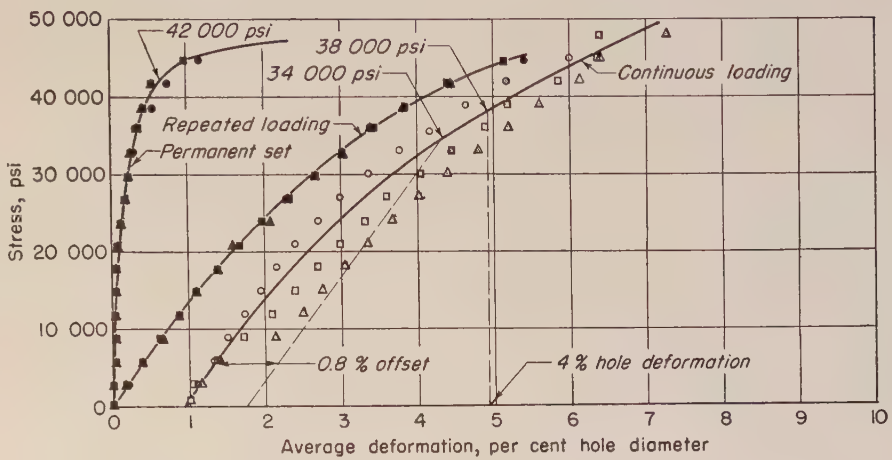


Fig. 6.—Bearing Test Data: Selectron 5003, Fiberglas 182A-14

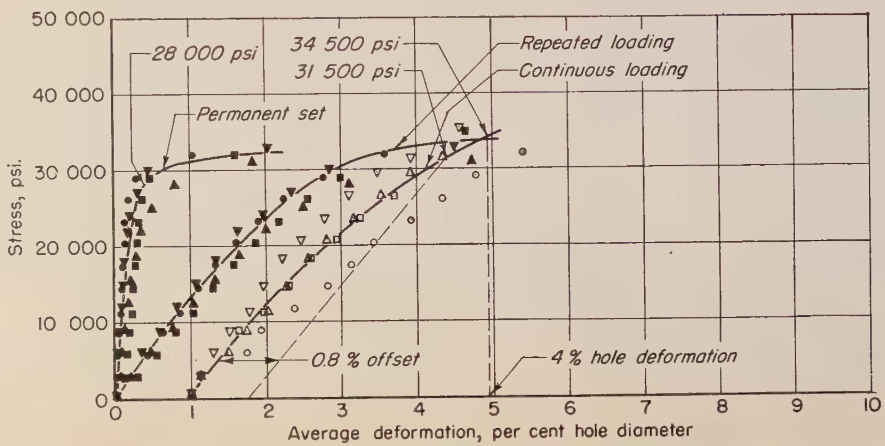


Fig. 7.—Bearing Test Data: Plyophen 5013, Fiberglas 182A-14

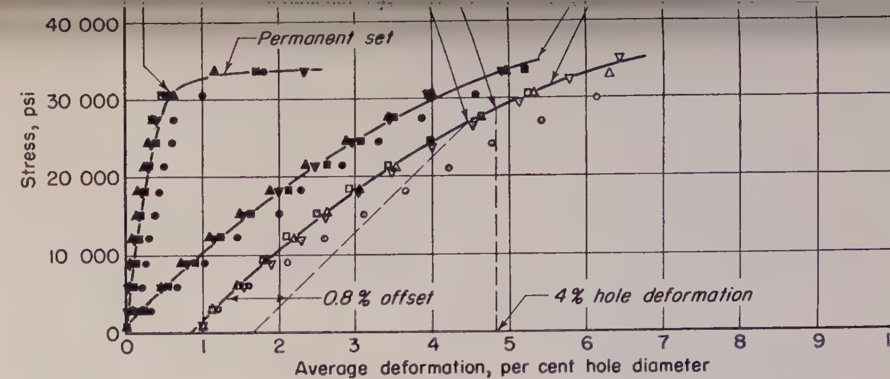


Fig. 8.—Bearing Test Data: Thalid 541, Fiberglas 182A-14

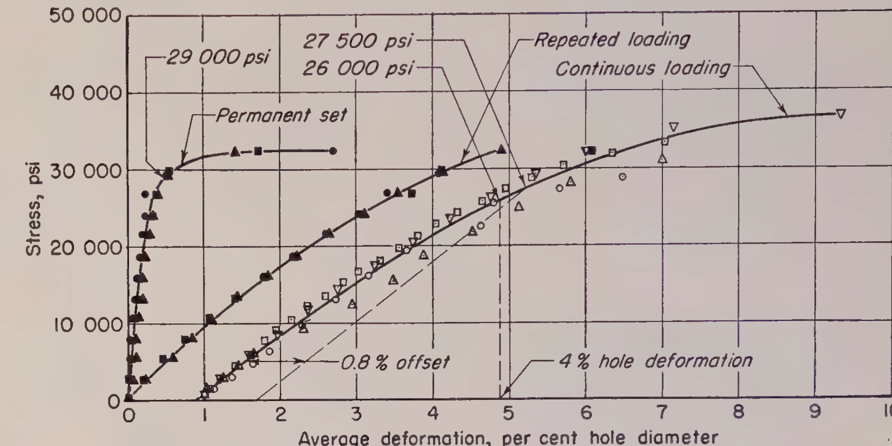


Fig. 9.—Bearing Test Data: Plaskon 911, Fiberglas 182A-14

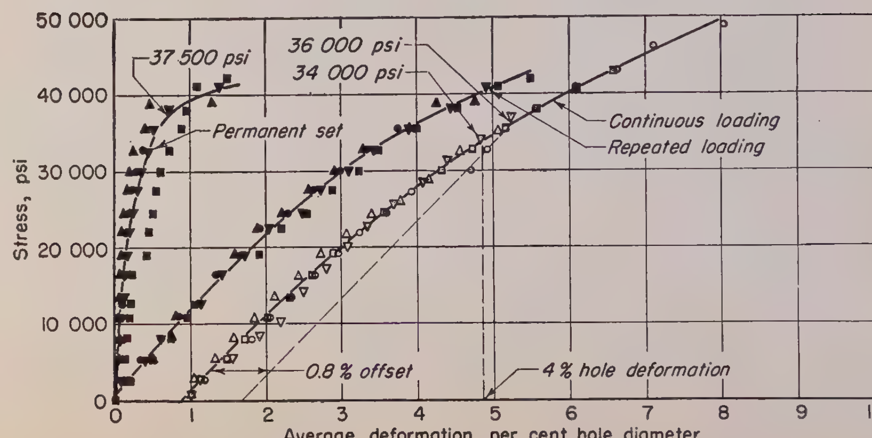


Fig. 10.—Bearing Test Data: Selectron 5007, Fiberglas 182A-14

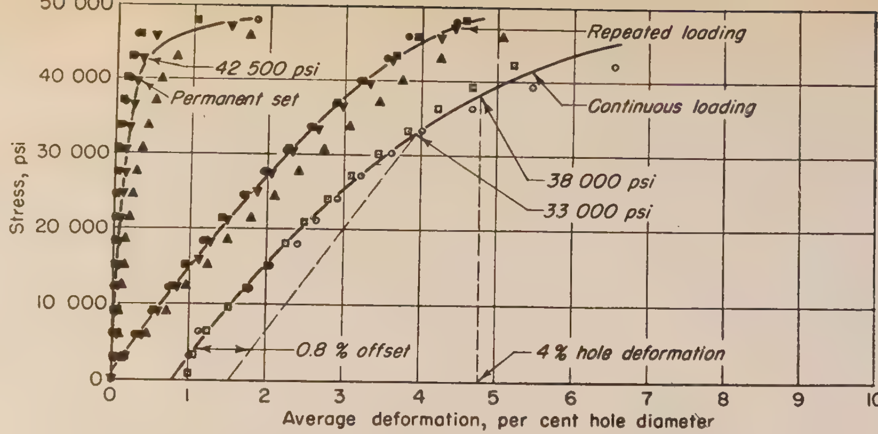


Fig. 11.—Bearing Test Data: Selectron 5003, Fiberglas 143A-14

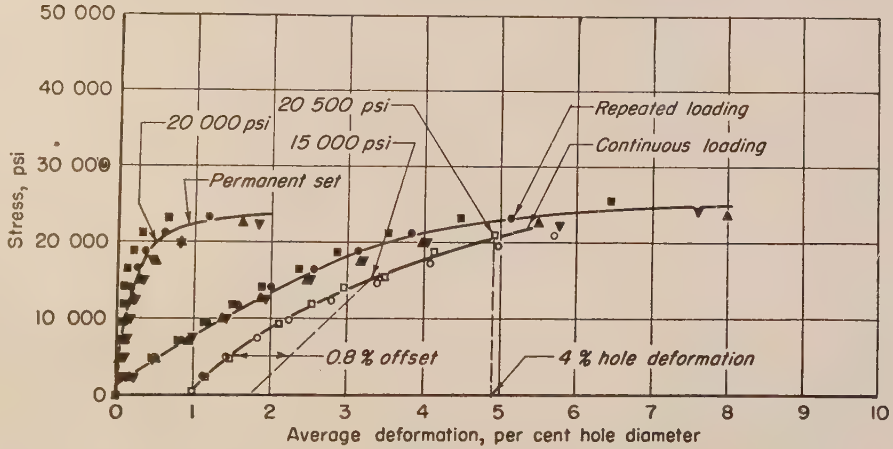
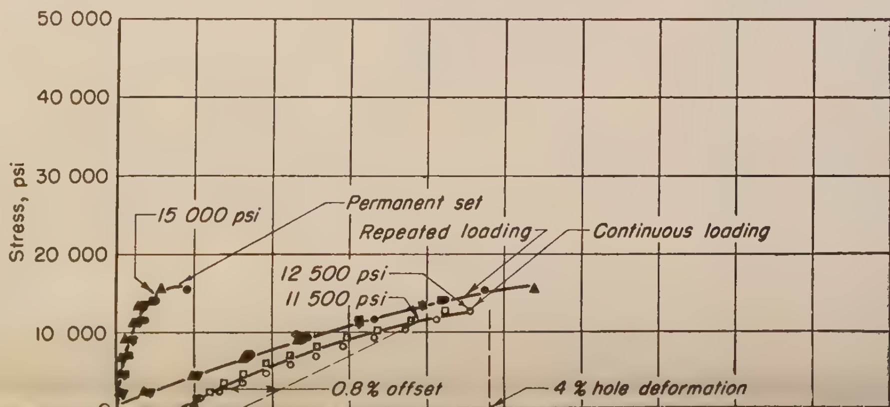


Fig. 12.—Bearing Test Data: Selectron 5003, Fortisan Cloth Uni-directional



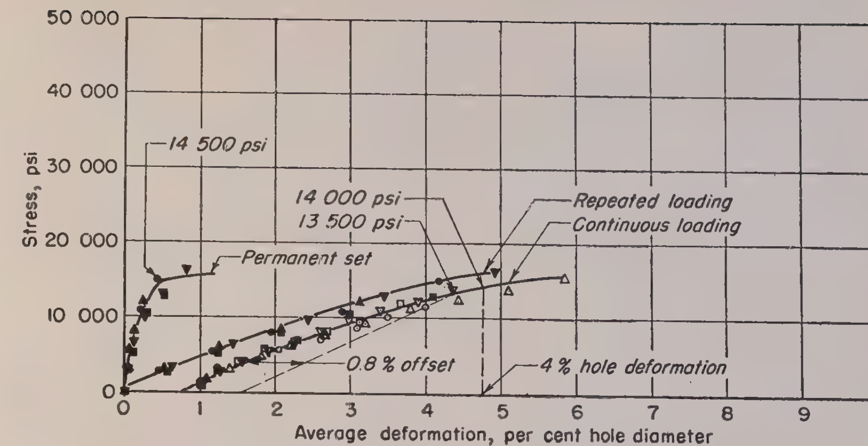


Fig. 14.—Bearing Test Data: Selectron 5003, Cotton Muslin

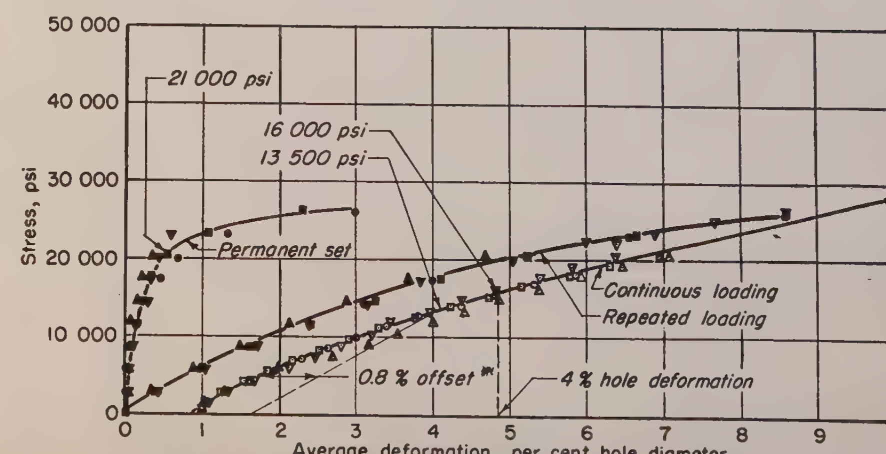


Fig. 15.—Bearing Test Data: Selectron 5003, Rayon Cloth

olished steel pins were set in reamed oles with a gage length of 2 in. between ole centers. The change in distance etween gage points on the two pins as ne specimen was loaded was measured y means of a conventional dial gage xtensometer as shown in Fig. 2. It was alculated that deformation of the oles under load comprised 80 to 90 per ent of the total extension of the specinen. The additional elongation of the lastic between holes was neglected in lotting results. This results in a small rror in the repeated load-deformation ata but has a negligible effect upon the ermanent set readings which are taken ith a very light load of 15 lb on the pecimen.

All tests were performed on a 60,000-b Southwark-Emery universal testing nachine. The 6000-lb range was used, he loads being applied at the rate of 00 lb per min. The following proedure is followed for the repeated oad-set tests:

1. The specimen is preloaded to 15 b and the extensometer dial gage set to ero.

2. The specimen is then loaded to 00 lb at the rate of 700 lb per min. he deformation is read as the load eaches 100 lb and the load released mmediately.

3. When the load has dropped to 15 b any immediate permanent set as vidence by the dial gage is recorded; hen load is reapplied to the specimen t the rate of 700 lb per min.

4. The deformation is read at 200 b and the above procedure repeated.

5. The test is continued with 100-lb ncrements in load until a definite yield point is noted as evidenced by a rapid increase in the permanent set.

6. Test data are presented in the form of two curves. In the first curve the average stresses based on projected pin area induced by the increasing loads are plotted *versus* the accompanying average per cent hole deformation. The second curve shows the permanent set after any particular load and is plotted with the ordinate of any point corresponding to the maximum previous stress in pounds per square inch and the abscissa as the permanent set in per cent hole deformation after release of load.

Figures 4 to 15 are the curves for the tests of the various resin-filler combinations.

Interpretation of the Test Data:

Examination of Figs. 4 to 15 immediately reveals that the load-deformation curves obtained by the repeated load test methods differ from those obtained in the continuous load tests in one major respect. There seems to be a specific value of stress at which the permanent set increases markedly with further stressing. It would seem reasonable then to define the bearing strength of the plastics as the stress at which the curve "breaks." The fundamental significance of this stress is that it indicates a point of instability; further stressing may produce catastrophic increases in the diameter of the connector holes. The main objection to this definition would seem to be that some of the materials tested (see Figs. 6, 10, and 12) do not have a well-defined break in the permanent-set curve.

This absence of a break in the curve has the same significance to the designer of laminated plastic joints that the stress-strain curve of materials which strain-harden rapidly has to the general structural designer. The slow increase of permanent set with applied load may be looked upon as an additional factor of safety; to utilize this the designer must take for his bearing strength a value of stress at which the permanent set curve seems to first decrease in slope. In any case, if the change in slope is rapid, then the bearing strength is well defined. Where the break is not very apparent, the need for a precise value is less important, and any low value after the first change in slope may be employed.

The results obtained from the two continuous-load and the repeated-load criteria are plotted for twelve different resin-filler combinations in Fig. 3, which has been placed ahead of the individual curves for ready reference.

Perhaps a tribute to the excellent judgment of the designers of the 4 per cent criterion for determining the bearing strength of plastics by the continuous load test is the close agreement of these results with those determined by the more rational repeated load-set tests described in this paper.

Acknowledgment:

The authors are indebted to Prof. H. D. Eberhart, Director of the Prosthetic Devices Research Project at the University of California, for his counsel and cooperation. J. Angel and E. L. Brown assisted in the performance of tests and plotting of results.

Bulk Factor and Apparent Density of Granular Polymers

By J. L. Williams[1] and W. W. Grinnell[1]

THE volume-weight relationship is an important property of granular polymers. It has an economic aspect in that it is a measure of the weight of molding powder which can be placed in a given size shipping container. Also, it is of interest to the design engineer, facilitating calculations of sizes of storage bins, hoppers, etc. Since most injection molding machines deliver granules to the heating chamber by volume, proper feed (volume to supply desired weight) techniques depend on this property. Therefore, it is the purpose of this paper to discuss various apparatus used to measure this property.

The volume-weight relationship can be expressed as the apparent density, the weight per unit volume, in consistent units. Another way of describing the volume-weight relationship is to compare the volume of granules to their volume after molding. This dimensionless ratio is called the bulk factor. It may be expressed as:

$$\text{Bulk Factor} = \frac{\text{Molded Density}}{\text{Apparent Density of Granules}}$$

Various granular shapes of a single material such as polystyrene or of materials having the same specific gravity after molding can be evaluated by comparing the apparent densities directly. But dissimilar materials such as polystyrene and cellulose acetate can be compared by use of bulk factors only and not by apparent densities.

Specific gravity is customarily a known dimensionless constant of a material. It can be determined for either solid or granular materials by ASTM Method D 792 - 48 T.[2] If density is calculated in grams per cubic centimeter, it will be numerically equal to specific gravity, so that in these units, specific gravity may be substituted for

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[1] The Dow Chemical Co., Midland, Mich.

[2] Tentative Methods of Test for Specific Gravity of Plastics (D 792 - 48 T), 1949 Book of ASTM Standards, Part 6, p. 728.

TABLE I.—COMPARISON OF TWO APPARENT DENSITY METHODS FOR POLYSTYRENE GRANULES TO THE "AS FILLED" PACKAGE DENSITY.

Sample	"As Filled" Package Density	Laboratory Method A	Vibrated Package Density	Loss in Height, in.	Laboratory Method B
SURFACE LUBRICATED MATERIALS					
No. 1.......	0.50	0.51	0.55	2.8	0.55
No. 2.......	0.52	0.51	0.55	1.5	0.57
No. 3.......	0.48	0.50	0.52	2.3	0.55
No. 4.......	0.50	0.52	0.54	2.5	0.59
No. 5.......	0.53	0.53	0.56	1.6	0.56
No. 6.......	0.53	0.54	0.56	1.5	0.60
Avg. mean....	0.51	0.52	0.55	2.0	0.57
SURFACE NONLUBRICATED MATERIALS					
No. 7.......	0.47	0.48	0.55	4.3	0.55
No. 8.......	0.45	0.46	0.52	4.3	0.51
No. 9.......	0.47	0.48	0.56	3.5	0.54
No. 10.......	0.46	0.47	0.53	3.5	0.54
Avg. mean.....	0.46	0.47	0.54	3.9	0.54

molded density in the calculation of bulk factor.

Plant Calculations of Apparent Density on Shipping Containers

Some determinations were made of the apparent densities of actual packages of commercial polystyrene pellets. The containers used were 20 in. in diameter and 30 in. high. They each were filled from an overhead hopper with 175 lb of granular polystyrene. The top was leveled by hand, and the height was measured. The apparent density was calculated as the ratio of the weight of the granules to the maximum weight possible for the volume of the package occupied by the granules.

The volume the granules occupy, expressed in cubic inches, divided by the specific volume of molded polystyrene (26.3 cu in. per lb) equals the maximum possible weight in pounds. The actual weight of granules (175 lb) divided by the maximum possible weight equals the apparent density.

The packages were then put on a commercial shaking device. After being shaken down, the height was measured and the calculations repeated. Table I shows the data obtained.

Apparent densities were determined on these same granules by Laboratory Methods A and B which are described later in this report.

The values obtained by these methods are also shown in Table I. Laboratory Method B gives results equivalent to the vibrated package densities. Laboratory Method A gives results equivalent to the "as filled" (unvibrated) package densities.

The first six samples had a surfa[ce] lubricant; the last four did not. T[he] apparent density of those with surfa[ce] lubricant is appreciably higher tha[n] those with no surface lubrication. The[re] is little difference after vibration.

Laboratory Apparatus and Procedures Used for Measuring Apparent Density

ASTM Method D 392 – 38[3] describ[es] the determination of apparent densit[y]. The apparatus used by this method [is] shown in Fig. 1. The use of this tes[t], called Method C in this paper, to meas[ure] the uniformity of a given grinder [or] pelletizer shows random variation [in] results in the second decimal place, eve[n] when no visual change has taken pla[ce] in the appearance of the granules a[nd] when the actual weight in the shippin[g] package indicates no real difference [is] present. It appears that there are ce[r]tain shortcomings, due to the measur[ing] apparatus.

The apparatus includes a 100-ml cu[p] of 1.572 in. diameter. It is not possib[le] to level granules of a nominal size [of] $\frac{1}{8}$ in. diameter with absolute accurac[y]. Therefore, errors of $^1/_{16}$ in. in height a[re] very possible. The desired height [is] 3.144 in., but an error of 2 per cent [is] probable and alters one figure in t[he] second decimal place.

It may be possible to reproduce r...

[3] Standard Method of Testing Molding Pow[ders] Used in Manufacturing Molded Electrical In[su]lators (D 392 – 38), 1949 Book of ASTM Stan[d]ards, Part 6, p. 55.

Fig. 1.—ASTM Apparatus for Determination of Apparent Density.

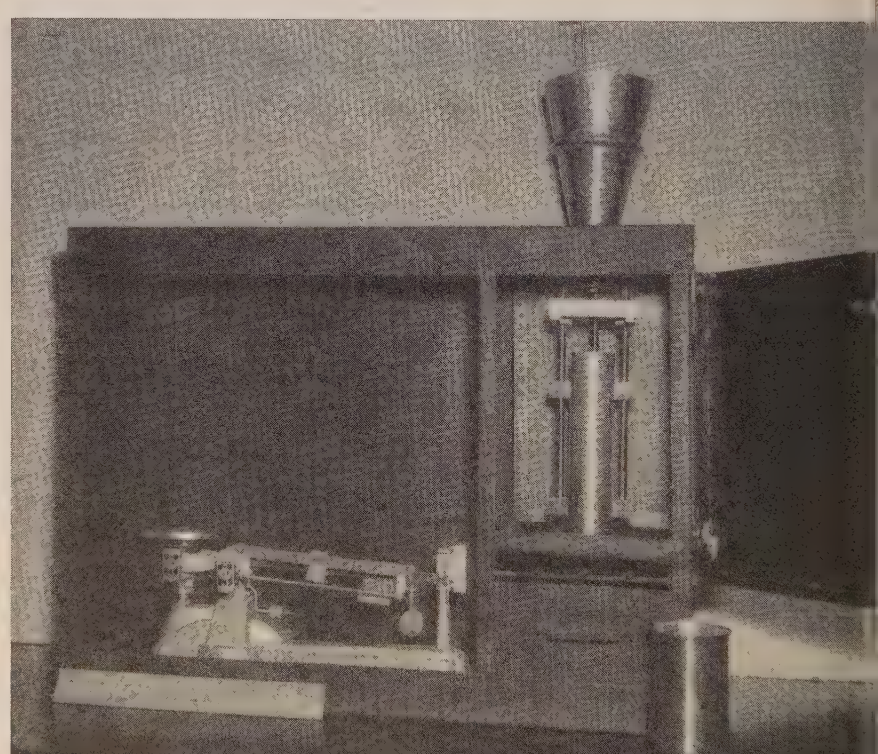

Fig. 2.—New Apparatus for Determination of Apparent Density.

ılts to within ±0.002 if more study and ork are done on the effects of packing, ue to method of filling the receiving up. Filling must be done by a standard technique and a funnel must be used.

Another variable in filling is the size f the hole in the funnel. In this ıethod, it is recognized that material ıay clog the $\frac{3}{8}$-in. opening, and loosenıg with a rod is permitted. This clogıing or "bridging" occurs with almost very sample of granular polystyrene.

The powder pourability section of ıis method classifies all such materials ı a category, implied as "nonpourable." ıctually, these materials feed well in ılant injection molding, even though he test suggests that special feeders ıill be required. Apparently, granules ıiffer from fine powders in their pourıbility behavior.

Should a funnel having a larger hole, in. in diameter for example, be conımplated, the range in time values obıained by its use would not be large nough for the range of apparent densiıes encountered in practice. Thereıre, this size would not seem to be a romising one in a pourability test.

Modified Scale and Procedure to Measure Apparent Density

A new method (called Method A) has ıeen developed based on the use of a ıodified apparatus. A photograph of he new apparatus is shown in Fig. 2. The receiving cup has a capacity of 400 ıl exactly. This volume was chosen mpirically. The cup is centered below he funnel. The floor on which it rests s an open grid which allows excess maıerial to fall into a suitable container. The unit is mounted in a metal cabinet.

Approximately 500 cu cm of material s placed in the funnel (see Fig. 2). The topper is removed with a quick pull. ıeveling of the material in the receiving up is done with the cross bar on the ıandle of the stopper. Direct readings f apparent density are obtained on a tandard volume of the material using a pecially modified scale.

An ordinary triple-beam balance was ıodified to read apparent density diıectly. The weights under the platform ıere removed and a special counterıeight, just sufficient to balance the are weight of the cup, plus 180 g, was ıade and suspended from a knife-edge ın the right end of the beam. The 10-g cale was moved to the back, and the liding weights on the back and middle ıeams were firmly locked in place by et screws. The 100-g slide was placed ın the front of the balance. The scale ıas turned over and its back face was ıarked with 25 new divisions each one epresenting 4 g. The projection on the 00-g rider which was intended to drop ıto notches was filed away.

Fig. 3.—Weighed Cup-Plunger ASTM Apparatus for Determination of Apparent Density.

The changes were made at the expense of some accuracy and sensitivity as the balance has a tendency to drop rather than to oscillate, but it affords a rapid and simple method of obtaining apparent density by moving only one rider to the nearest division. The first and last divisions and every fifth division were stamped, that is, 45, 50, 55, ... 70. A special 180-g tare weight was prepared which is used with the empty cup to "zero" the balance.

The principle of operation of this procedure (Method A) is that each 4 g of weight in the cup represents 0.01 unit of apparent density, since the total volume is 400 cu cm. If there is exactly 180 g of material with the balance at zero, the apparent density is 180/400 or 0.45 (g per cu cm). If there are 200 g, it requires moving the rider five 4-g divisions for this 20-g increase in weight. This is the point marked 50, or 0.50-g per cu cm (200/400 = 0.50, etc.).

If other values of apparent density are desired, the addition of suitable counterweights and changing of the scale are all that are necessary.

In the procedure just described, a fixed volume of granules is weighed. ASTM Methods D 954[4] describe a means of obtaining apparent density by use of a cup with a weighted plunger. Here the volume of a weighed amount is measured. This method was tried on granular materials, but since the apparatus has a large cross-sectional area (3 in. in diameter), it was difficult to obtain a level surface. It does give reproducible results and is a useful way of measuring this property of granular plastic materials. It is not as rapid as Method A. It is called Method B in the tables of data. See Fig. 3.

Discussion of Data by Laboratory Methods A, B, and C

Table II shows results by these three methods on three samples of lubricated polymers and four samples of unlubricated polymers. While all of the methods gave reproducible results to at least one division in the second decimal place, the methods do not agree with each other. It can also be pointed out that Method A gives average values 0.05 unit lower than Method B except for the finely granulated material. Method C, the standard ASTM test, gives values somewhat between the other two.

Table III shows results using the new procedure (Method A) on three polymers by six analysts. The first three men were experienced laboratory workers who had run this and similar tests

[4] Methods of Test for Apparent Density and Bulk Factor of Non-Pouring Molding Powders (D 954 – 48 T), 1949 Book of ASTM Standards, Part 6, p. 738.

TABLE II.—COMPARISON OF APPARENT DENSITIES.[a]

Sample	Method B		Method A		Method C	
Lubricated Materials						
No. 11......	0.64	0.64	0.59	0.59	0.61	0.61
No. 12......	0.63	0.63	0.55	0.55	0.60	0.60
No. 13......	0.58	0.58	0.51	0.51	0.56	0.55
Avg. mean...	0.61	0.61	0.55	0.55	0.59	0.59
Unlubricated Materials						
No. 14......	0.56	0.56	0.56	0.56	0.58	0.59
No. 15......	0.62	0.62	0.57	0.57	0.63	0.64
No. 16......	0.60	0.60	0.55	0.55	0.59	0.59
No. 17......	0.54	0.54	0.48	0.48	0.52	0.53
Avg. mean...	0.58	0.58	0.54	0.54	0.58	0.58
Fines						
No. 18......	0.51	0.51	0.50	0.49	0.46	0.46

[a] Method B, ASTM D 954 – 48 T, 150 g 5-lb weight. Method A, 400-cu cm cup (described in this report). Method C, ASTM D 392 – 38 (100-ml cup).

TABLE III.—DUPLICATION OF RESULTS OBTAINABLE WHEN USING NEW PROCEDURE (METHOD A).

Sample	Operator No. 1	Operator No. 2	Operator No. 3	Operator No. 4	Operator No. 5	Operator No. 6
No. 19......	0.56	0.56	0.56	0.56	0.56	0.56
No. 20......	0.56	0.56	0.57	0.56	0.57	0.56
No. 21......	0.51	0.51	0.52	...	...	...

TABLE IV.—EFFECT OF VARIATION [of] DISTANCE FROM FUNNEL TO RECEIV[ER] ON RESULTS OF NEW METHOD.

Sample	3 in.	1.5 in.
No. 22....	0.52	0.53
No. 23....	0.53	0.53
No. 24....	0.50	0.49
No. 25....	0.54	0.53

many times previously. The last three were plant operators who were making their first use of the apparatus. The latter were given oral instructions, and the values shown in Table III were their first results. The values are not different from the others, and in no case is there more than 0.01 difference between any of the results.

In Table IV data are shown on the effect of distance from funnel to receiver in the new method. The distance does not appear to be critical. A distance of 1.5 in. was adopted.

SUMMARY

Two ASTM methods for measuring apparent density have been compared with a modified procedure and an apparatus which has a somewhat higher degree of accuracy. This modified method is a means for controlling almost all of the variables usually encounter[ed] and eliminates all calculation. Typi[cal] values obtained with the various app[a]ratus have been shown and compare[d]. Since all of these methods are empiric[al] the actual value will be somewhat [de]pendent upon the conditions chose[n]. The conditions selected were based [on] comparison with values calculated fr[om] filling of commercial shipping conta[in]ers.

Application of the Specific Gravity Gradient Column to th[e] Quantitative Determination of Additives in a Base Material[*]

By Charles R. Stock[1] and Elizabeth R. Scofield[1]

SYNOPSIS

The requirements for, and limitations of a method of quantitative estimation of additives in a base material, measured by differences in density, are set forth. The specific gravity gradient column of Linderström-Lang is described and discussed in terms of its range, sensitivity, stability, and calibration. The bearing which these factors have on the method is illustrated by an example in which the concentration of a melamine resin*, applied to a wool flannel for control of shrinkage, is determined.

INTEREST in reliable methods of determining the amount and distribution of additives in base materials has prompted the use of analytical chemical and spectroscopic, microscopic, X-ray diffraction, and radioactive tracer procedures in the past. The problem of measuring low concentrations of resins, sizes, fillers, plasticizers, and other chemicals in textiles, rubber, plastics, and the like may, however, not always be satisfactorily resolved by these methods. In some instances, for example, poor sensitivity or precision of known procedures, or chemical similarity of the additive to the base material, is encountered. Especially difficult is the determination of uniformity of distribution resulting when addition is made by mixing, dipping, padding, etc., or of the rate of loss of the additive by evaporation, dusting-off, leaching, or solvation. Additional means of solving the problem, supplementing those mentioned above, would be valuable.

When chemical identification is not required, it is frequently possible to take advantage of a difference in specific gravity between the additive and the base substance of a binary[2] mixture. As in all experimental procedures, there are several limitations to the applicability of the test. In this instance the main factors are: (1) that the difference in specific gravity between the base and the additive, the volume ratio of the latter to the former, and the sensitivity of the detecting means, be adequate to provide the required precision; (2) that the additive and base be unaffected in composition and volume ratio by the method of measurement. (This applies also to the loss or gain of fortuitous "additives" such as water or air.) The relationships pointed out in (1) can be calculated readily from density considerations.

If W_a, V_a, and ρ_a are the weight, volume, and density, respectively, of t[he] additive material and if, with subscri[pt]

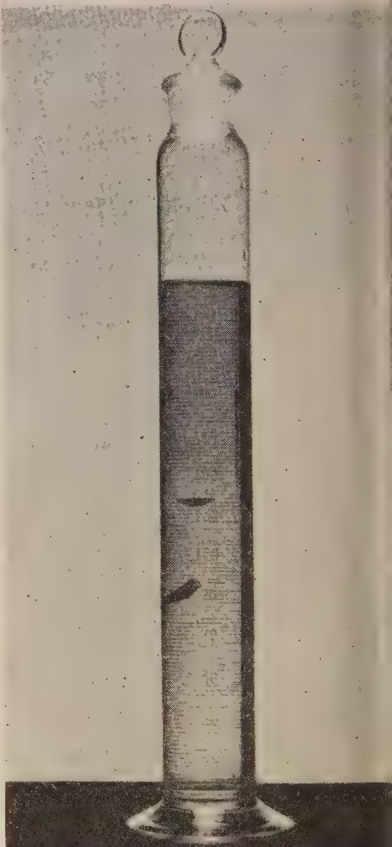

Fig. 1.—Specific Gravity Gradient Colu[mn] Separating Vulcanized Linseed Oil (ρ [=] 1.07) from Tire Tread Stock (ρ = 1.1[...]) Half Saturated NaCl and Half Water[.]

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* Presented at a Meeting of Committee D-13 on Textile Materials, October, 1950.

[1] Senior Group Leader and Junior Physicist, respectively, Analytical and Testing Division, American Cyanamid Co., Stamford, Conn.

[2] For some purposes, several components (additives) can be considered as one, if their proportions remain unchanged.

), the same significance holds for the base material, the three quantities will be related by the definitive equation for density.

$$W_a = \rho_a V_a, \text{ and } W_b = \rho_b V_b \quad \ldots\ldots(1)$$

A mixture of additive and base can be taken as an entity and similarly expressed,

$$W_a + W_b = \rho_m(V_a + V_b) \quad \ldots\ldots(2)$$

where ρ_m is the density of the combined substances. If we now substitute from Eq 1 to eliminate V_a and V_b from Eq 2, and also eliminate W_a and W_b by substituting the concentration, c, from

$$W_a = c\,W_b \quad \ldots\ldots\ldots\ldots\ldots\ldots(3)$$

an equation will result which can be rearranged to relate the concentration to ρ_a, ρ_b and ρ_m only, thus,

$$c = -\rho_a(\rho_b - \rho_m)/\rho_b(\rho_a - \rho_m) \quad \ldots\ldots\ldots(4)$$

The sensitivity, s, of this method of detection can be found by examining the rate at which ρ_m will change when the concentration of the additive is changed. This can be done by rearranging Eq 4 to make it explicit in ρ_m, then differentiating both sides with respect to c.

$$s = d\rho_m/dc = (\rho_a^2\rho_b - \rho_a\rho_b^2)\,(c\rho_b + \rho_a)^{-2} \quad \ldots\ldots\ldots\ldots\ldots\ldots(5)$$

The quantity in the first bracket is the most important factor in determining the sensitivity of the method. The sensitivity obviously goes to zero when $\rho_a = \rho_b$; the effect of changes in concentration, however, is generally small.

A specific gravity[3] gradient column is a vertical column of miscible liquids of different specific gravities which have been so mixed that the specific gravity of the mixture changes in a continuous fashion from top to bottom. It was first described by Linderström-Lang (1)[4] as a convenient means for measuring the density of substances where small differentials in density required a discriminating means capable of high sensitivity.

Plotting gravity *versus* height in the column results in a sigmoid curve wherein the center third is substantially linear. Objects dropped in at the top therefore sink until a level of the same density is reached, as shown in the photograph of a typical column, Fig. 1.

Preparation of Columns

Columns have been prepared in two ways: One way is to pour a series of mixtures of two liquids carefully, one above the other, in a glass tube or graduate. The mixtures are made up in proportions such that each differs from the one above and below it in the column by a desired differential in specific gravity. An easier procedure, the one used in the discussion to follow, is to fill each half of the column either with two pure liquids or two different mixtures of the liquids. In either case the gradient smooths out by diffusion in a few hours and is substantially stable after 24 hr. Moderate stirring at the interface accelerates this process in the latter column.

Once prepared, a column is surprisingly durable. Changes in the gradient occur extremely slowly, making it possible to use the same column, inserting and removing specimens, for a month or more.

Many liquids can be found that will make a satisfactory column. For practical use, however, the field will be narrowed by the need for using liquids which do not interact chemically, possess fairly low viscosity and volatility, are additive by volume, and are inert to the materials to be immersed in them. Despite these restrictions it is usually possible to find pure or mixed liquids covering a wide range of specific gravities as well as permitting a flexible choice of sensitivity.

Dry organic liquids can be used where moisture is to be avoided; aqueous solutions of sugar or salts may be employed where advantageous. Among the common solvents that have been used successfully are, kerosine (ρ = 0.79 g per cu cm), xylene (ρ = 0.855 g per cu cm), bromobenzene (ρ = 1.48 g per cu cm), and carbon tetrachloride (ρ = 1.58 g per cu cm). Methylene iodide (ρ = 3.325 g per cu cm) has been used as the heavier liquid in a column requiring high density.

Columns have been used by Boyer, Spencer, and Wiley (**2**) to follow polymerization and crystallization in synthetic polymers, and by Tessler, Woodberry and Mark (**3**), to examine influences of spinning variables on synthetic fibers and to follow differential digestion of cellulose. Preston and Nimkar (**4**), who have pointed to the value of the method in identifying natural and synthetic fibers in mixtures, have also extended the inherent ability of the columns to provide precise data even for small particles, by viewing short lengths of individual fibers through polarizing screens.

Calibration

Columns have been calibrated in three ways: (1) by floating droplets of salt solutions of known specific gravity, (2) by a colorimetric method, where a dye is added to one of the components, (3) by preparing stable solid materials of known specific gravity to rest at various levels as reference points. Preston and Nimkar (**4**) have suggested hollow glass floats for this purpose. In special instances, refractive index determinations can also be used. The specific gravity of a sample can either be found from a curve or by interpolation by finding its height in the column.

Floats offer several advantages which influenced their use here. Variation in specific gravity of a column from small slow changes in temperature can be tolerated to a greater extent if permanent reference points are always visible in the column. This makes temperature control less of a problem.

For the illustrative textile problem to follow, floats were formed by casting selected mixtures of two polyester resins inside glass capillaries, removing and breaking them into convenient lengths. They were calibrated by a sink-float procedure, using precisely measured mixtures of carbon tetrachloride and xylene, carefully thermostatted. Once a satisfactory set of floats was prepared, differing in specific gravity by small amounts over the useful range, they were examined for permanence of calibration by immersing for several weeks in the solvent mixture, then recalibrating. No variations larger than experimental error were found at the end of the investigation.

Stability:

Coarse columns, that is, those which cover a wide range of specific gravity, are relatively less sensitive to fluctuations in temperature than are those of narrower range. Variations in temperature change the density of each component—liquids, floats, and specimens—according to β, their cubical coefficients of thermal expansion. On the other hand, a larger difference from top to bottom increases the tendency for mixing, hence the coarser columns are less stable and less durable than the finer ones. Changes in temperature probably promote convective mixing.

Concentration of Melamine Resin on Wool

The utility of these columns for determining quantitatively the concentration of an additive on a base material was explored by attempting to measure the concentration of a melamine resin applied to a woolen cloth for control of shrinkage. Other means for attacking this problem have provided evidence that resin solids are not applied to the wool in the concentration that would be calculated from the concentration of the treating bath and

[3] The terms "density" and "specific gravity" are practically equivalent when, as in this work, the specific gravities of the liquids are found in terms of water at 4 C, and when these determinations, as well as calibration and use of the columns, are conducted at a single temperature, 25 C in this instance.

[4] The boldface numbers in parentheses refer to the list of references appended to this paper.

the wet pickup on the cloth. However, these methods had recognized defects which weakened the conclusions.

The material for the tests was prepared by immersing swatches of unfinished 8-oz women's-wear wool flannel in melamine resin[5] solutions containing 0, 2.5, 5.0, 7.5, and 10.0 per cent resin solids, causing them to pick up 100, 108, 96, and 109 per cent of the solutions, respectively, based on the dry weight of the swatch. ("Nominal" concentrations can be calculated as the products of the two figures.) All were then cured in a circulating air oven for 9 min at 290 F. The resin solution was also coated on a microscope slide, carefully cured to minimize the formation of bubbles, and finally scraped off and pulverized.

The limiting factors discussed earlier were instrumental in the choice of pure, commercial mixture of xylene isomers $\left(\rho\,\frac{25\,C}{4\,C} = 0.85514 \text{ g per cu cm}\right)$ as the less dense and carbon tetrachloride $\left(\rho\,\frac{25\,C}{4\,C} = 1.58517 \text{ g per cu cm}\right)$ as the more dense liquid. These encompass the density range within which is found both wool and the resin, namely, 1.3 to 1.5.

Columns were prepared as described earlier, using stoppered 250-ml graduates wherein the 2-ml graduations, used in this case as a scale of height, were about 2 mm apart. Readings could be made to a half-division.

By means of exploratory columns, ρ_a, the density of the cured resin powder, was found to be 1.4290 g per cu cm, and ρ_b, the density of the wool, 1.3169 g per cu cm. By means of Eq 5, it could then be found that a change in resin concentration of 1 per cent near zero would change ρ_m by 0.0010; near 10 per cent concentration this rate of change would be about 0.0009 g per cu cm. Inasmuch as it was desired to detect a change in concentration of 0.50 per cent, a column with a gradient of 0.0009 g per cu cm, or less, per 2-mm division, would be required.

Examination of the effect of change in temperature on the position of the floats and specimens was also carried out. For xylene and carbon tetrachloride, β is about 0.001/C while that for the polyester resins is only about 0.0003/C. The coefficient for wool could not be found, but is probably not much different from the resins. Change in temperature of the liquids will therefore cause the system of floats and specimens to rise and fall in the column in a body, with some displacement of the wool relative to the floats. The magnitude of the error in precision resulting from a fluctuation in temperature will depend only on the latter displacement. In this instance, calculation of the error is hampered because β for wool is not known. However, it appears that a total change of 2 C would cause less than 0.05 per cent error, or no greater than the experimental precision.

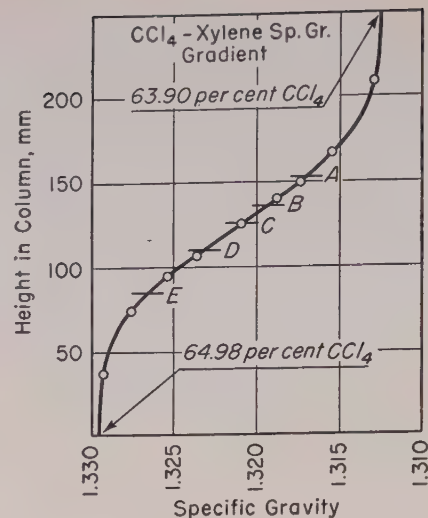

Fig. 2.—Curve for a Representative Column, Showing Positions of Calibrating Floats (Circles) and Treated Wool Specimens (Lines), Showing Standard Deviation.

It is useful to recognize in a problem of this kind that the determination of the specific gravity figures need not be carried out to a high degree of *accuracy*, but that adequate *precision* must be maintained. This is because relative values and differentials are important to calculations in this problem, rather than determination of "absolute" densities. In this instance the relative precision was maintained in part by calibrating the floats in the same liquids used for the columns and at the same temperature as for the pycnometric measurement of the liquids.

Columns were prepared wherein the gradient was 0.00030 to 0.00040 per division near the center. Because of the nonlinearity, the gradient decreases, that is sensitivity increases, as the top or bottom is approached. These columns were made up of equal parts of a heavier mixture, consisting of 64.98 per cent carbon tetrachloride and the remainder xylene, and the lighter mixture, containing 63.90 per cent carbon tetrachloride. To reduce temperature effects, they were kept in a conditioned

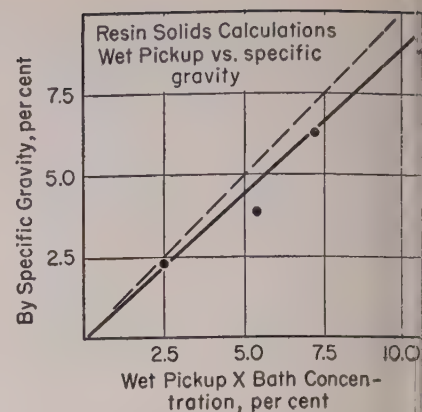

Fig. 3.—Calculated Relationship Betwe[en] Two Methods of Estimating Concentr[a]tion of Melamine Resin Additive on Wo[ol] That Is, by Wet Pickup and by Speci[fic] Gravity.

room at 25 ± 1 C and were jackete[d] in a 5-gal water bath to elimina[te] short-term fluctuations.

The total range of the columns f[or] floating the treated wool specime[ns] covered from about 1.312 to 1.331, about 0.02 unit. Figure 2 shows [a] calibration curve for one of these co[l]umns, illustrating the positions of t[he] floats, the average positions of ya[rn] specimens (A to E), and their standar[d] deviation in specific gravity, as well [as] the composition of the liquid mixtur[e]. The cured pulverized resin required [a] column of higher density to include [its] specific gravity. This column cover[s] the range from 1.370 to 1.430.

The procedure followed in examini[ng] all of the wool samples was as follov[s]. Ten short lengths of yarn were c[ut] from random locations in each swat[ch], different lengths, that is, $\frac{1}{4}$ or $\frac{1}{2}$ i[n], being employed in alternate swatches [to] identify in the columns, treatment wi[th] successively increasing concentratio[n] of resin bath. The yarns were dropp[ed] briefly in boiling xylene to dry and [to] displace air, then immediately in t[he] lighter of the two mixtures used [to] make the columns. The densest of t[he] groups of specimens was introduced in[to] a column first, followed in sequence [by] less dense. Because of fairly wide vari[a]tion in density within each group, [it] was found advantageous in this [in]stance to use two columns, placi[ng] alternate groups in each. This elim[i]nated the complication of interminglin[g] groups. Hence one column contain[ed] yarns with nominal solids concent[ra]tions of 0, 5.4, and 10.9 per cent, wh[ile]

TABLE I.—AVERAGE SPECIFIC GRAVITY AND STANDARD DEVIATION OF YARNS FR[OM] RESIN-TREATED WOOL FLANNEL.

	Specimen A	Specimen B	Specimen C	Specimen D	Specim[en] E
Nominal concentration, per cent	No resin	2.5	5.4	7.2	10.9
Specific gravity	1.3169	1.3192	1.3208	1.3231	1.32[illegible]
Standard deviation	0.0012	0.0009	0.0012	0.0010	0.00[illegible]

[5] Lanaset Resin (Reg. Trade Mark).

BLE II.—CONCENTRATION OF RESIN ON YARN—COMPARISON OF TWO METHODS OF CALCULATION.

	Specimen B	Specimen C	Specimen D	Specimen E
Calculated from treatment, per cent........	2.5	5.4	7.2	10.9
Calculated from specific gravity, per cent...	2.3	3.9	6.4	10.2
Line 2/line 1 × 100....................	92[a]	72	89	94

[a] Not significantly different from 100.

second column contained those of 2.5 d 7.2 per cent. The resin powder s also dried and soaked in the mixe before being placed in its column.

As a result of from three to seven reptions of these tests in different colins and with fresh specimens in each e, the figures in Table I were obned for the five swatches:

Equation 4 was then used to calcue the concentration of resin solids. ese are listed on line 2 of Table II, npared with line 1, the concentran calculated from the product of t pickup and concentration of the th. Line 3 relates the two sets of ta. Hence it is found that the resin ids retained in the flannel were not ual to those calculated from the ncentration of the resin bath and the t pickup. They appear to be prortional, however, examination of g. 3 showing that the retention is out 87 per cent of the assumed conntration.

HANGES IN SPECIFIC GRAVITY OF OOL WITH LENGTH OF IMMERSION

An interesting side light should be inted out which was noted during the e of this method on woolen yarns. though it did not prove too troubleme a complication, the yarns were und to continue to change slightly in ecific gravity over long periods of ne in a column. It was noted that the nsity of wool lacking resin increased iformly up to 200 hr, going from 3169 after 24 hr to a final figure of 3192. Wool containing 3.9 per cent sin solids, on the other hand, rose from 1.3208 and was still rising 400 hr later, when its density was 1.3235.

A plot of density *versus* square root of time is shown in Fig. 4. It can be seen here that at least the earlier stages are linear in these two functions, suggesting that the phenomenon may be one of diffusion. Both Hermans and Vermaas (5) and Preston (6) have pointed out the possibility of changes in density, depending, in the first place, on the choice of surrounding medium and, in the second, on the existence of voids of molecular dimensions in wool and cotton, representing regions of chain termination and similar discontinuities in structure. Without more extensive inquiry than that described here, it is not possible to state with certainty which of several mobile components of the system might be diffusing alone or in combination. Increase in density with time could arise from loss of air or water from the fiber, with replacement by solvent, or by disproportionate absorption of the liquids without displacement of another substance. The molecular sizes of carbon tetrachloride and xylene (2.55 and 4.30 Å., respectively) make the latter plausible, though not exclusively so.

CONCLUSIONS

By means of the foregoing determinations of the concentration of melamine resin on wool, the details of the use of specific gravity gradient columns have been brought out. This example is believed to illustrate both the advantages and limitations of the method, for quantitative measurement of mixtures of two substances differing in density.

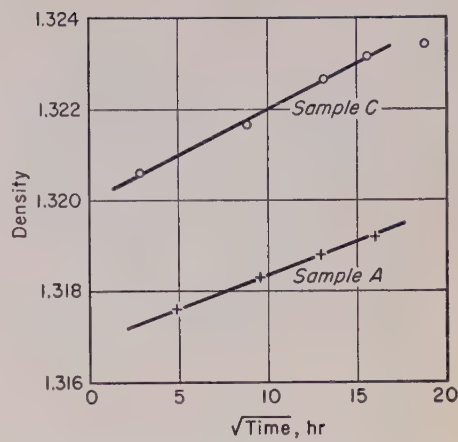

Fig. 4.—Change in Density with Time of Two Wool Specimens, Sample A Untreated, and Sample C 3.9 Per Cent Resin Added.

Acknowledgment:

We wish to express our thanks for the interest and assistance rendered by N. T. Woodberry and F. L. Graves, whose discussions and suggestions were instrumental in forwarding this work. We wish also to acknowledge with thanks the support afforded by R. P. Chapman, Director of the Division, without whose permission this work could not have been carried out.

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An Electric Timing and Operating Mechanism for a Bitumen Testing Penetrometer

By B. M. Holmes[1]

SYNOPSIS

A device for obtaining accurate automatic operation of an ordinary bitumen-testing penetrometer is described. The apparatus consists of a solenoid release attachment, controlled by an electronic timer based on a thyratron delay circuit of standard design. With this attachment, it is possible to reproduce the nominal 5-sec plunger release period, normally employed for penetration tests, with an accuracy of ±0.4 per cent.

SINCE the introduction of the penetrometer as an instrument for comparing the rheological characteristics of bitumen products, various mechanisms have been proposed to improve on the stop-watch timing and hand-control methods of plunger control. Thus Mahr (1)[2] used an electromagnetic clutch in place of the usual

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

[1] Division of Building Research, Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia.
[2] The boldface numbers in parentheses refer to the list of references appended to this paper.

hand-operated lever, the electromagnet being de-energized for the requisite period by a "Siemen's intermediate relay." Rather more complicated arrangements also, involving mechanical escapements actuated by a pendulum (2) or a clockwork motor (the Hutchinson penetrometer) (3) have been constructed. These devices have apparently not been widely used, and the improved manually operated penetrometer of Forrest (4) or a penetrometer designed to give equivalent results has remained the standard instrument for examining bituminous products. Probably this is due to the complication and expense of the automatic attachments proposed so far and to the sufficiency of the simple manual machine for many purposes.

Recently the author, when using a penetrometer of modified Forrest design for measuring the consistency of plastic caulking compounds, experienced difficulty in obtaining reproducible results. Although the variation was, in the main, due to the heterogeneity of the materials under test, it seemed desirable to minimize other sources of error. The instrument which is now described was devised for this purpose. It is relatively simple, easily attached to ordinary manual instruments, and has an accuracy greater than the figure of 0.1 sec previously reported for an instrument of this type (5).

Apparatus

Penetrometer and Solenoid Mechanism:

The penetrometer in use at the Division of Building Research was constructed in the divisional workshops. It is essentially similar to the Forrest instrument, the chief difference being that the friction brake is actuated by a side lever instead of the more usual thumb push.

This instrument was adapted for automatic operation by attaching a solenoid in such a manner that the movement of the solenoid armature was transmitted by a lever and pin to the penetrometer hand release lever. The actual solenoid used was an obsolete aircraft bomb-release unit ("Autolite" Type WS 4001, 24 v dc, 5 w). After modification of the winding for 12 v operation, this proved ideal for the purpose. It was considered preferable to energize the solenoid with direct, rather than alternating, current to avoid possible errors resulting from 50-cycle vibration of the penetrometer needle during penetration measurements, and for this a 12-v accumulator was used.

A sectional view of the solenoid attachment is shown in Fig. 1. In this unit the armature, *A*, moves in the magnetic field against the action of the return spring, *S*. The armature is con-

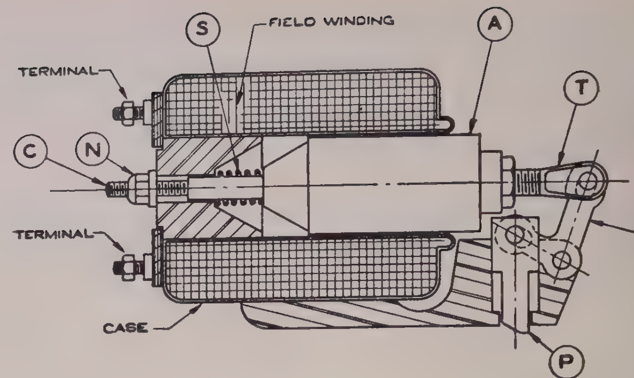
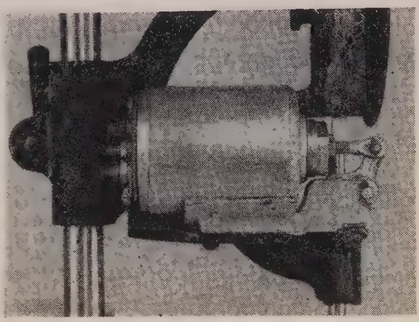
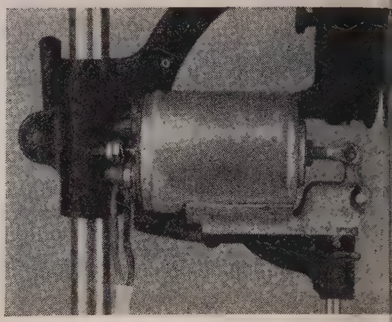


Fig. 1.—Diagrammatic Arrangement of Solenoid Release.



(*a*) Position of armature at rest position.



(*b*) Solenoid energized; note depression of plunger lever by solenoid lever mechanism.

Fig. 2.—Location and Mode of Operation of Solenoid Unit.

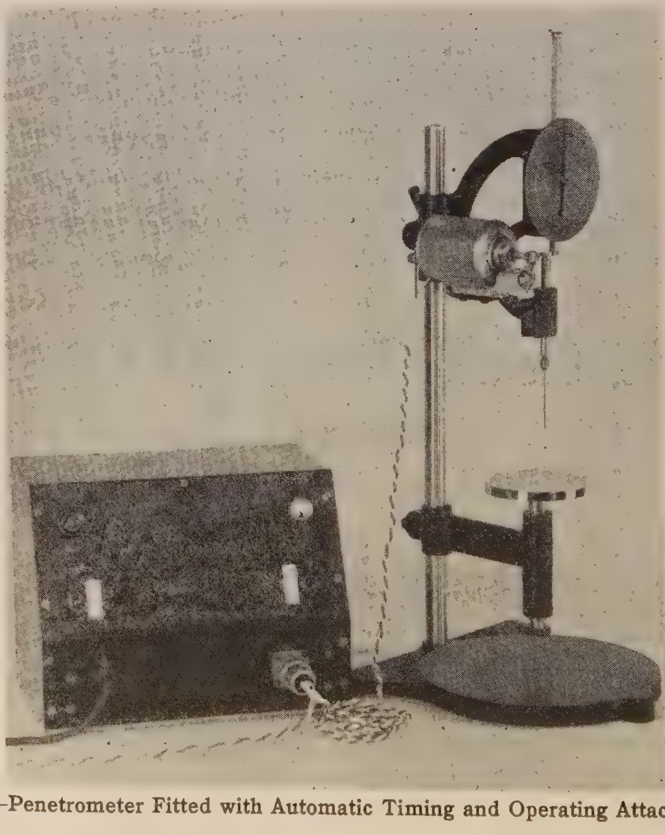


Fig. 3.—Penetrometer Fitted with Automatic Timing and Operating Attachments

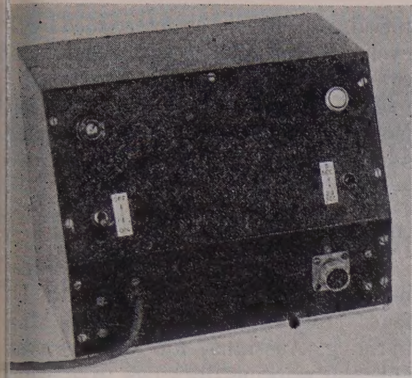


Fig. 4.—Penetrometer Timing Unit.
The push button control is located at the top ght-hand corner of the panel of the unit.

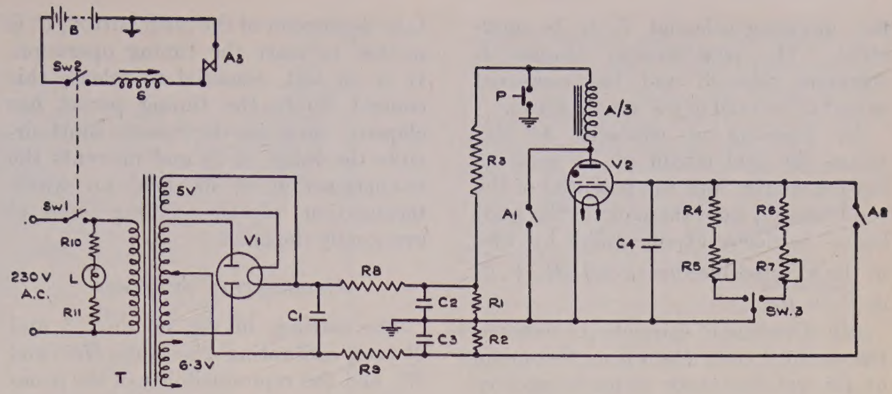
ected by a turnbuckle, *T*, to a cranked ever, *L* which in turn operates a verical pin, *P*. The displacement of the rmature, when the solenoid is enerized, may be regulated by a selfocking unit, *N*, working on the screw, *'*. The manner of attachment of the olenoid and its method of operation are hown in Fig. 2.

utomatic Timer:

The timing unit is shown in Figs. 3 nd 4. As will be seen from the circuit iagram (Fig. 5) it consists essentially of type 884 thyratron tube with a reistance-capacity network in the grid ircuit and a post office relay in series ith the anode supply. The unit is nergized from the alternating current ains through a transformer connected o a 5Y3 rectifier tube and a resistanceondenser smoothing system. Alternaive delay periods may be selected by neans of a double pole switch: in the nit described these were arranged to be bout 2½ and 5 sec, controls for fine djustment of these periods being proided in each case by rheostats. The enetrometer plunger is released for the elected period by momentarily operatng a push button. The selector switch nd push button may be seen in Fig. ; they are situated on the right-hand ide of the panel of the timer.

peration of Timer and Solenoid:

The operating sequence of the penerometer attachments is as follows:



T. TRANSFORMER 240-0-240, 40 mA; 5V; 6·3 V.
A/3. RELAY P/O TYPE 10,000 OHM.
A1, A2. RELAY CONTACTS LIGHT DUTY. } CONTACTS SHOWN IN REST POSITION
A3. RELAY CONTACTS HEAVY DUTY.
B. ACCUMULATOR 12 V.
P. PUSH BUTTON.
Sw.1, Sw.2. SWITCH, SINGLE POLE, 2 WAY.
Sw.3. SWITCH, DOUBLE POLE.
L. NEON LAMP.
S. SOLENOID.
C1, C2, C3. ELECTROLYTIC CONDENSERS 8 μF, 600 V.
C4. BLOCK CONDENSER 8 μF, 600 V.
R1, R2, R3. RESISTORS 10 K Ω, 5 W.
R4. RESISTOR, 0·25 M Ω.
R6. RESISTOR, 0·12 M Ω.
R5, R7. VARIABLE RESISTORS, 10 K Ω.
R8, R9. RESISTORS 5 K Ω, 5 W.
R10, R11. RESISTORS 0·1 M Ω.
V1. VALVE, 5Y3G.
V2. VALVE, 884.

Fig. 5.—Penetrometer Timing Circuit.

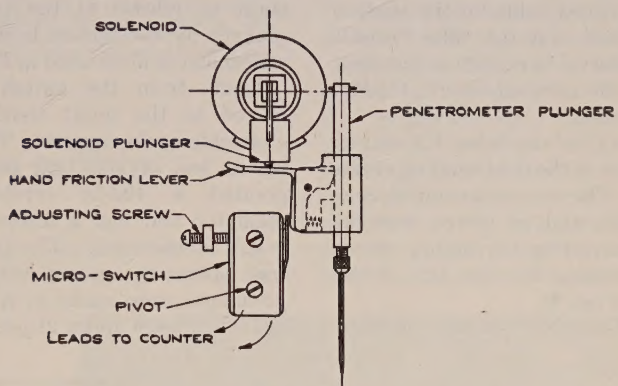


Fig. 6.—Diagrammatic Arrangement of Micro-Switch on Penetrometer for Calibration of Timer.

1. *Switching on.*—Closure of the 2-way switch *SW1* and *SW2* (Fig. 5) completes alternating current supply to the timer transformer, *T*, and direct current supply to the penetrometer operating solenoid, *S*, with the following results:

(*a*) The solenoid, *S*, is temporarily energized since the relay contacts *A3* are initially closed.

(*b*) The cathodes of tubes *V1* and *V2* heat up whereupon high-tension direct current is delivered to the anode of *V2*. Since the grid of this tube is initially unbiased, current flows in the anode circuit causing the relay *A/3* to be energized. Relay contacts *A3* now open and *A1* and *A2* close.

(*c*) Opening of contacts *A3* de-energizes the operating solenoid, *S*, and the solenoid armature and the penetrometer friction lever therefore return to their rest positions. The position of the penetrometer plunger and needle may now be adjusted for a penetration reading in the usual way.

(*d*) Closure of contacts, *A1*, short-circuits the anode and cathode of the thyratron tube, *V2*. The relay, *A/3*, is thus made self-locking and for the time being becomes independent of the condition of the discharge tube.

(*e*) Closure of contacts *A2* connects the grid circuit of *V2* to the negative (relative to earth) potential, developed across the resistor, *R2*. The grid of *V2* and the grid condenser, *C4*, thus become negatively charged with respect to earth, the magnitude of this charge at equilibrium depending on the potential difference across resistor, *R2*. In the unit described this potential difference is − 105v.

2. *Timing Sequence.*—The unit is now in its operating state. The timing sequence, started by momentary depression of the push button, *P*, is as follows:

(*a*) Depression of *P* short-circuits the field winding of the relay, *A/3*, causing collapse of its magnetic field. Contacts *A3* thus close and *A1* and *A2* open.

(*b*) Closure of contacts *A3* causes

the operating solenoid, S, to be energized. The penetrometer plunger is therefore released and the measured period of free fall of the needle starts.

(*c*) Opening of contacts *A2* detaches the grid circuit of *V2* from its biasing source, and the potential of the condenser *C4* (and therefore of the grid) begins to decay exponentially by way of the selected bleeder circuit ($R_4 + R_5$ or $R_6 + R_7$).

(*d*) Opening of contacts *A1* removes the earthing connection from the anode of *V2* and the anode is made positive with respect to the cathode by a potential depending on the potential drop across resistor *R1* (95 v in the unit under discussion). However, since the grid of *V2* is at this stage biased beyond the cut-off potential, current does not immediately flow in the anode circuit.

(*e*) At a given time after depression of the push button and release of the penetrometer, the grid potential of *V2* falls to the critical value for the applied anode potential and the tube "fires." This time interval is of course the time constant of the selected circuit, *C4-R4-R5* or *C4-R6-R7*.

(*f*) "Firing" of the tube, *V2*, causes current to flow in the field winding of the relay, *A/3*. The events set out in Sections 1(*c*), (*d*), and (*e*) above, now recur, thus completing the timing operation and arresting the free fall of the penetrometer needle.

It should be noted that only momentary depression of the push button, P, is needed to start the timing operation. It is, in fact, essential to release this control before the timing period has elapsed, since its depression short-circuits the relay, *A/3*, and prevents the re-energization of its field on which termination of the timing interval eventually depends.

Calibration of Timer

The settings of the nominal 5 and 2½-sec calibrating rheostats, *R5* and *R7*, and the reproducibility of the penetration intervals given by this equipment, were determined in the following way:

A sensitive micro-switch was fitted to the penetrometer with the leaf contact of the switch bearing against the plunger release lever. The position of the switch was set by a screw adjustment so that contact between two points in the switch occurred at the instant of release of the penetrometer plunger by the release lever. This arrangement is illustrated in Fig. 6.

Leads from the switch were connected to the input terminals of an electronic cycle counter. This counter, which was of standard design, incorporated a 400-kc crystal-controlled oscillator and had a resolving time of ±2.5 microsecond. The penetrometer was operated automatically and adjustments were made to *R5* and *R7* to provide a 5-sec and a 2½-sec release interval, respectively, as determined by [the] cycle counter. Repeated measureme[nts] over the 5-sec interval produced maximum variation of ±20 millisec[onds] from the mean; that is, the nominal sec interval is subject to an error ±0.4 per cent.

Acknowledgment:

Thanks are due to the General Sup[er]intendent of the Commonwealth [De]fence Research Laboratories, M[ari]byrnong, Australia, for making av[ail]able the working drawings from wh[ich] the penetrometer (manually operate[d]) referred to in this report, was c[on]structed.

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Building Officials Conference of America Building Codes

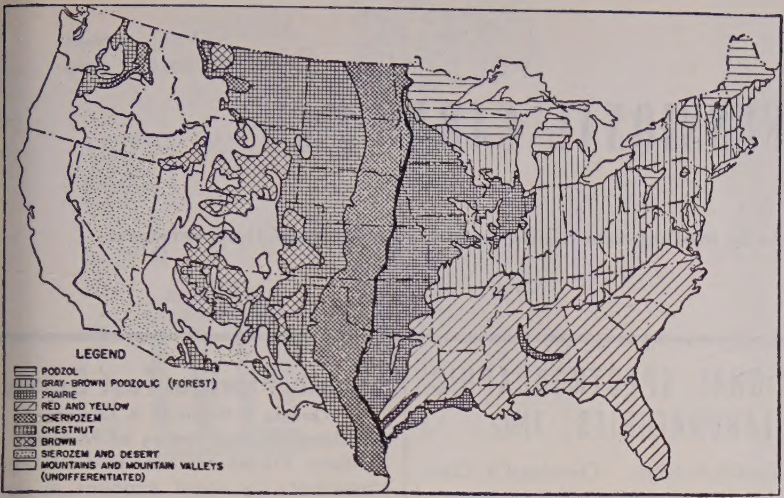
The 1950 editions of two building codes, prepared and published by the Building Officials Conference of America, are now available. The Basic Building Code includes a compilation of fundamental performance requirements for all types of construction and use group classifications of buildings and the means for their administration in the department of building inspection. The Abridged Building Code comprises a condensed version of the Basic Building Code designed for use in municipalities principally residential in character, covering the necessary details of the customary types of construction encountered in the smaller community, in which the building inspection office is likely to be inadequately staffed for the administration and enforcement of the more comprehensive Basic Building Code. A third publication, known as the Construction Code, is being promulgated now and will comprise detailed rules and specifications in loose-leaf form which will be constantly in flux to keep step with new developments in the industry to implement the functional performance standards of the Basic Building Code.

The purpose of the Basic Building Code is to unify the administration of building laws, thus assuring economy and safety through the benefits and advantages of national use of all materials and methods of construction. Two methods of procedure are recommended, namely, its adoption as a model reference standard of minimum requirements by the State together with an enabling act authorizing any municipality within the State to promulgate the code with or without the addition or elimination of specific requirements necesitated by local physical or legal considerations; and, in such states where enabling acts or other statutes empower individual municipalities to adopt recognized authoritative standards by reference, its promulgation by the adoption of a short ordinance incorporating the Basic Building Code by title, date of publication, and name of the promulgating authority, the Building Officials Conference of America, Inc. Reference to nationally recognized standards, including those of ASTM, is listed in several appendices of the Basic Building Code.

The Abridged Building Code is not a complete building code, but does provide minimum requirements to govern the erection of safe housing for dwelling purposes and for the smaller business and community buildings incidental to local civic life and activities. Where the necess[ary] state enabling acts have been provid[ed] this code can be adopted by referenc[e] those municipalities which either have code at all, or which are operating u[nder] codes that are outmoded or restrictiv[e] their provisions.

Review of Current Educational Research

The Engineering Col[lege] Research Council of the American ciety for Engineering Education has released the 1951 Review of Curr[ent] Research and Directory of Member In[sti]tutions. The activities listed in regar[d] research are closely related to the edu[ca]tional function of engineering schools, in most cases the work is done by th[ose] who share educational responsibilit[y]. The review notes that some projects [re]flect the obligation of colleges and uni[ver]sities to assist in the development of sources and industry within the com[mu]nity or state from which they gain s[up]port. The book lists the different leges and universities which are par[t] ECRC, enumerates the type of resea[rch] carried out, the number of personnel ticipating, and the allocation of resea[rch] expenditures for the current fiscal year.



s illustration appears in the "Symposium on the Classification and Identification of s," and shows the general distribution of the important zonal groups of soils in the United States

he line running from the western portion of Minnesota down through the middle of Texas roughly les the soils of the United States into two categories. Pedalfer soils which have developed under a id climate are to the east of this heavy line, and Pedocal soils developed under semi-arid and arid ate are to the West with exceptions occurring on the West Coast and in mountains where conditions proper for Pedalfers to develop. The name Pedalfer and Pedocal originated in 1921 and are coined ı the Greek word "Pedo" meaning ground and the chemical symbols Al, Fe, Ca, indicating that alfers accumulate aluminum and iron in the soil profile, and Pedocals accumulate calcium.

he Symposium comprising 96 pages, bound in heavy paper, is priced at $1.65 to nonmembers and 5 to members.

STM Standard Covers Welded Spheres to Solve quid Nitrogen Storage

ONE of the most complex blems encountered in the storage of id nitrogen was the construction of a -gal tank capable for 5500 psi serv- at −320 F.

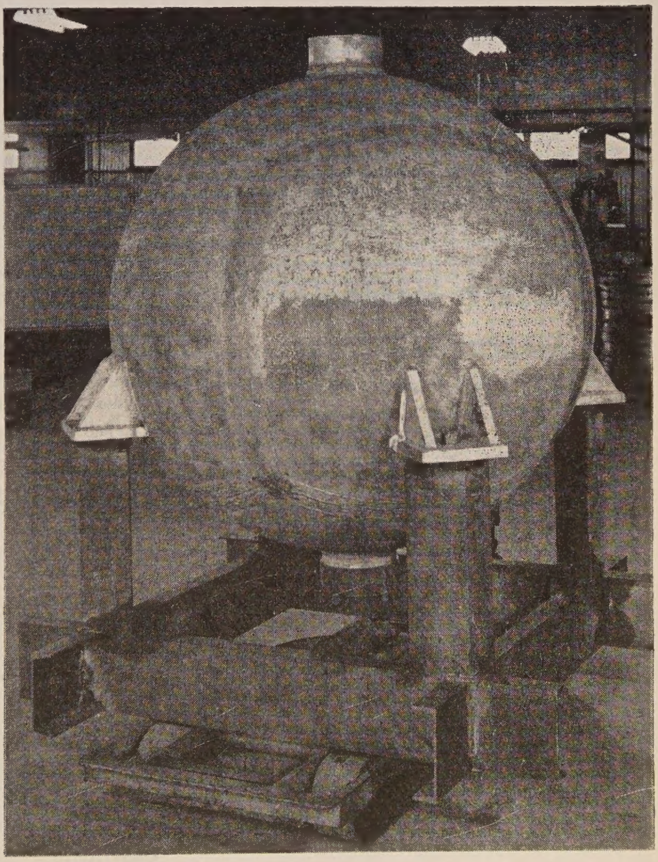
'he liquid nitrogen is converted into eous nitrogen by controlling the -off rate of the liquid at any desired ssure up to about 10,000 psi. The eous nitrogen is used as a source of rgy to expel the propellants and lizing agents from the propellant ks to the injection nozzle of a rocket ver plant.

'or the construction of the vessel, TM-A 240 grade C steel was used. ırpy impact values of the parent al as well as hot forming charac- stics of the plate were carried out and the results analyzed. Case histories on other liquid nitrogen and liquid oxygen vessels, which have been in operation at other missile test stations for over two years and have given trouble-free service, also helped in the selection of this particular material. A special design employing six-segment construction was chosen. Plate for the six-segment pattern was ordered from the mill in $3\frac{1}{2}$ by 38 by 38-in. size with adequate stock for trim after forming.

Fit-up of the six segments was simplified by the use of $\frac{3}{16}$ by 1-in. backup strip which supported and aligned all the segments until the root weld could be made. The first weld pass was made using heliarc to insure maximum penetration with minimum burn-through of the backup strip.

Two intermediate X-ray inspections were made on all welds to keep a constant check on the welding procedure and to insure maximum integrity of the welds throughout the entire welding process. Dy-Check inspection was used to detect surface discontinuities such as carters, cracks, improper fusion, etc.

After quenching and subsequent heat treatment, radiographic inspection of the completed unit determined the vessel to be sound and acceptable. Successful function of this vessel in the completed nitrogen evaporator system for which it was designed has made it possible to deliver pressure and volume in excess of present requirements.



PROFESSIONAL CARDS

On these pages are announcements by leading organizations and individuals of their services.

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In the solution of testing and research problems the guidance of professional advice is often most helpful and desirable.

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